# **EPA Superfund Record of Decision:**

NAVAL WEAPONS STATION - YORKTOWN EPA ID: VA8170024170 OU 07 YORKTOWN, VA 09/30/2003

### Final

### Record of Decision

Site 22–Burn Pad Operable Unit No. XVII OU-07

### Naval Weapons Station Yorktown Yorktown, Virginia



September 2003



#### **FINAL**

### RECORD OF DECISION SITE 22-BURN PAD

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

#### **CONTRACT TASK ORDER 0275**

#### Prepared for:

# DEPARTMENT OF THE NAVY ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND Norfolk, Virginia

Under the:

LANTDIV CLEAN PROGRAM CONTRACT N62470-95-D-6007

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**SEPTEMBER 2003** 

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#### ACRONYMS AND ABBREVIATIONS

ARAR Applicable or Relevant and Appropriate Requirements

CERCLA Comprehensive Environmental Response, Compensation and Liability Act

COC Contaminant of Concern

COPC Contaminant of Potential Concern

cPAH Carcinogenic Polynuclear Aromatic Hydrocarbon

CRP Community Relations Program

CSF Cancer Slope Factor

ESQD Explosives Safety Quantity Distance

FFA Federal Facility Agreement

HI Hazard Index HQ Hazard Quotient

ILCR Incremental Lifetime Cancer Risk

mg/kg Milligrams per Kilograms

NPL National Priorities List

NTCRA Non-Time-Critical Removal Action

OU Operable Unit

PAH Polynuclear Aromatic Hydrocarbon PRAP Proposed Remedial Action Plan

RA Risk Assessment

RAB Restoration Advisory Board

RfD Reference Dose
RI Remedial Investigation
ROD Record of Decision

USEPA United States Environmental Protection Agency

WPNSTA Naval Weapons Station

#### 1.0 DECLARATION OF THE RECORD OF DECISION

#### 1.1 Site Name and Location

Name: Site 22-Burn Pad

Location: Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia

#### 1.2 Statement of Basis and Purpose

This Record of Decision (ROD) documents that no further remedial action is necessary to reduce the risks posed by contaminated soil at Site 22 (the Site), designated Operable Unit (OU) XVII, at WPNSTA Yorktown, Virginia. The no further action decision was made in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. §§ 9601 thru 9675 and, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations Part 300. Section 2.2.3 of this ROD lists the documents that contain the information supporting the no further action decision, and these documents are contained in the administrative record for WPNSTA Yorktown. The Commonwealth of Virginia concurs with the selected no further action decision.

#### 1.3 <u>Description of the Selected Remedy</u>

The Navy completed a non-time-critical removal action (NTCRA) in the summer of 2002, which removed contaminated soil exceeding remediation levels at Site 22. Confirmation sampling determined that Site 22 poses no threat to human health or the environment. Therefore, no further remedial action is necessary for this site. The remediation of the soil at Site 22 (OU XVII) is part of a comprehensive environmental investigation and cleanup that is currently being performed at WPNSTA Yorktown under the CERCLA program. This ROD addresses only soil at the Site; the other OUs located at WPNSTA Yorktown are being investigated separately under its installation restoration program and will be addressed in future RODs. The groundwater is being treated as a separate OU and will be addressed on an installation-wide basis.

#### 1.4 <u>Statutory Determination</u>

The selected remedy protects human health and the environment and is cost effective. The Site does not require a five-year review because no hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

F.F. Aucremanne, CAPT, CEC, USN

Regional Engineer

By Direction of the Commander, Navy Region, Mid-Atlantic

Abraham Ferdas, Director

Hazardous Site Cleanup Division

United States Environmental Protection Agency, Region III

IJ

Date

#### 2.0 DECISION SUMMARY

#### 2.1 Site Name, Location, and Description

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City Counties and the City of Newport News (Figure 2-1). WPNSTA is bounded on the northwest by the WPNSTA Yorktown Cheatham Annex Site and the Virginia Emergency Fuel Farm; on the northeast by the York River and the Colonial National Historic Parkway; on the southwest by Route 143 and Interstate 64; and on the southeast by Route 238 and the town of Lackey.

Site 22 covers approximately nine acres and is located south of Site 4 (Figure 2-2). Site 22 was used from the 1940s until 1995. Former operations included the open burning of explosives and explosives-contaminated material. Spent solvents from loading operations were also burned at the Site. In 1996, a biocell was constructed at the Site to biologically treat contaminated soil and sediment. Use of the biocell ended in 1998 and the biocell was demolished. The general topography of Site 22 is a continuation of the natural gentle sloping nature of Site 4. Site 22 is an elevated plateau with its ground surface sloping to the southwest from 32 to 20 feet above mean sea level. A dropoff of approximately 20 feet occurs on the southeast, south, and southwest sides of Site 22, leading directly to the east branch of Felgates Creek.

#### 2.2 <u>Site History and Enforcement Activities</u>

#### 2.2.1 Site History

Originally named the U.S. Navy Mine Depot, WPNSTA Yorktown was established in 1918 to support the laying of mines in the North Sea during World War I. For 20 years after World War I, the depot received, reclaimed, stored, and issued mines, depth charges, and related materials. During World War II, the facility was expanded to include three additional 2,4,6-trinitrotoluene loading plants and new torpedo overhaul facilities. A research and development laboratory for experimentation with high explosives was established in 1944. In 1947, a quality evaluation laboratory was developed to monitor special tasks assigned to the facility, which included the design and development of depth charges and advanced underwater weapons. On August 7, 1959, the depot was renamed the U.S. Naval Weapons Station. Today, the primary mission of WPNSTA Yorktown is to provide ordnance, technical support, and related services to sustain the war-fighting capability of the armed forces in support of national military strategy.

Site 22 was used for burning waste explosives and spent solvents from loading operations. Burning was conducted at the Site from the early 1940s until 1995 when disposal by open burning ceased. Because of past operations, the Site was used for a treatability study for the treatment of explosive-contaminated soil and sediment in 1996. As part of the treatability study, a biocell was constructed which measured approximately 150-feet long by 90-feet wide by 7-feet deep. The cell was completed in 1996 and was used to remediate soil from other sites at WPNSTA Yorktown. The use of the Site 22 biocell ended in 1999 because more cost-effective methods of treating explosive-contaminated soil and sediment became available.

#### 2.2.2 Enforcement Activities

On October 15, 1992, WPNSTA Yorktown was included on the National Priorities List (NPL). A Federal Facility Agreement (FFA) between the United States Environmental Protection Agency (USEPA) Region III, the Commonwealth of Virginia, and the Department of the Navy (the Navy) was finalized for WPNSTA Yorktown in August of 1994. The FFA applies to the investigation, development, selection, and implementation of response actions for all releases or threatened releases of hazardous substances, contaminants, hazardous wastes, hazardous constituents, or pollutants at or from WPNSTA Yorktown. No documented enforcement activities have been conducted to date at Site 22 under the FFA.

#### 2.2.3 History of Previous Investigations and Removals

During the preparation of the Round Two Remedial Investigation (RI) Work Plan, Site 22 was identified by USEPA, the Commonwealth of Virginia, and the Navy as an Installation Restoration site. Round Two RI activities were conducted at Site 22 in 1996 to further assess the nature and extent of contamination at the Site. Based on the results of the Round Two RI (Baker, 2000), a Feasibility Study was conducted for Site 22 (Baker, 2001).

Based on recommendations in the Round Two RI report and the Feasibility Study, a NTCRA was completed in the summer of 2002. Remediation levels were developed based on the outcome of the risk assessments performed as part of the RI, and contaminated soil presenting ecological risk was removed. There were no human health risks presented by contaminated soil at the Site. The remediation levels included the following: HMX (5.7 milligrams per kilograms [mg/kg]), cadmium (4 mg/kg), copper (100 mg/kg), and lead (48.7 mg/kg). The human health risk assessment conducted as part of the RI did not identify carcinogenic polynuclear aromatic hydrocarbons (cPAHs) as a contaminant of concern. However, to remain consistent with Site 4, soil contaminated with cPAHs exceeding the remediation level

of 1 mg/kg were removed. Contaminated soil was excavated to a depth of approximately two feet and confirmation samples were collected. Approximately 3,450 cubic yards of soil were removed. Excavated areas were backfilled with clean soil, topsoil was added, and the areas were seeded. This NTCRA is documented in the closeout report completed by Shaw Environmental and Infrastructure, Inc. (Shaw, 2003). Figure 2-3 shows the location of the excavation areas at Site 22.

The NTCRA complied with all Federal and Commonwealth location- and action-specific applicable or relevant and appropriate requirements (ARARs) as listed below. Chemical-specific ARARs or to-be-considered criteria were not available for soil; therefore, risk-based remediation levels were developed for contaminated soil. These remediation levels were protective of both human health and the environment.

#### **Location-Specific ARARs**

- Archaeological Resources Protection Act of 1979 (16 U.S.C. § 470aa-mm) (32 CFR Part 229; 43 CFR Part 7)
- Executive Order 11990, Protection of Wetlands (40 CFR Part 6, Appendix A, excluding Sections 6(a)(2), 6(a)(4), 6(a)(6), and 6(c); 40 CFR § 6.302(a))
- Clean Water Act, Section 404 (33 U.S.C. § 1344) (40 CFR § 230.10; 40 CFR § 231 [231.1,231.2, 231.7, 231.8])
- Virginia Wetlands Regulation (VR 450-01-0051 §§ 1-5; 4 VAC 20-390-10 to -50)

#### Action-Specific ARARs

- Resource Conservation and Recovery Act, Subtitle C (Hazardous Waste Management) (42 U.S.C. § § 6921-693 9e)
- Virginia Hazardous Waste Management Regulations (VR 672-10-1 et seq; 9 VAC 20-60-10 et seq.)
- Virginia Erosion and Sediment Control Regulations (VR 625-02-00 §§ 1-11; 4 VAC 50-30-1- to -110)

#### 2.3 Highlights of Community Participation

The Proposed Remedial Action Plan (PRAP) for Site 22 was made available to the public in January of 2001. The PRAP presented to the public that the chosen alternative for the Site was to excavate contaminated soil to levels acceptable for industrial land use, dispose of excavated soils off-site, and

restrict future land use accordingly. The PRAP and supporting documents can be found in the administrative record for WPNSTA Yorktown. Information for this site can be found at:

Virgil I. Grissom Public Library 366 Deshazor Drive Newport News, VA 23506 (757) 369-3190

Additional information can be obtained from:

Mr. Channing Blackwell
Installation Restoration Program Manager
Naval Weapons Station Yorktown
Building 406, Code 950
Yorktown, VA 23691-0160
(757) 887-4086

The notice of availability of the PRAP was published in the *Daily Press* on January 21, 2001. A public comment period was held from January 21 to March 6, 2001. In addition, a public meeting was held on February 21, 2001 at the Charles E. Brown Community Building on Route 238 in Lackey, Virginia to inform interested members of the community about preferred remedial alternatives under consideration and to seek public comments. At this meeting, representatives from USEPA Region III, the Commonwealth of Virginia, and the Navy answered questions about Site 22 and the remedial alternatives available for the Site. A transcript of the public meeting is included as Appendix A. No comments beyond clarifying questions were received at the public meeting or during the public comment period.

Before preparation of a final ROD for Site 22, the Navy determined that it was feasible to excavate soil to levels that are acceptable for all land uses, which would in turn negate the need for a land use restriction at Site 22. Although a final remedy of excavation to acceptable ecological levels, coupled with off-site disposal, differs from the remedy presented in the PRAP, the difference is not fundamental and was foreseeable by the public. To hasten the speed with which the Site was cleaned up, the Navy further decided to proceed with the work as a NTCRA. The Navy informed the public of its intent to undertake the NTCRA, and the progress of the removal action, during Restoration Advisory Board (RAB) meetings that were held quarterly in 2002. The WPNSTA RAB is comprised of state and federal agency representatives, technical and business people, and members of the community at large. No negative comments were received from members of the RAB regarding the NTCRA.

#### 2.4 Scope and Role of the Remedy

The work at Site 22 is part of the comprehensive environmental investigations and remediation being conducted under the Installation Restoration Program at WPNSTA Yorktown. WPNSTA Yorktown is a large (10,624 acres) and complex Superfund site. To allow manageable projects, the Navy divided WPNSTA into 30 sites and several site screening areas. Some sites have been further divided into OUs. There are currently 18 OUs at WPNSTA. The remedial actions for OUs I through XII, OU XIV, XVII, and XVIII have been completed; OU XVII consisted of HMX- and inorganic-contaminated soil at Site 22. OUs XIII, XV, and XVI are currently in the construction phase of the remedial action. OU XVI is scheduled for completion in FY 2004, while remedial activities for OUs XIII and XV will continue into FY 2005.

Because no unacceptable human health or environmental risks remain after the excavation of contaminated soil at Site 22, no further action is required and land use controls will not be implemented. The NTCRA is the final response action for soils at Site 22.

#### 2.5 <u>Summary of Site Characteristics</u>

This section addresses surface and subsurface soil contamination resulting from past disposal practices. Contamination identified in groundwater, surface water, and sediment will not be discussed in this ROD. Groundwater, surface water, and sediment will be the subject of a comprehensive groundwater ROD, which will be undertaken when all subsequent investigations are completed.

#### 2.5.1 Surface Soil

Twenty-six surface soil samples were collected prior to the construction of the biocell at Site 22. Samples were analyzed for target compound list organics, explosive compounds, and target analyte list inorganics. Due to the lack of vegetation and the general soil type at Site 22 (i.e., fill material), surface soil samples were not analyzed for volatile organics. Volatile organics would not be present at Site 22 under existing conditions.

PAHs and explosives were detected in several surface soil samples collected at Site 22. Benzo(a)pyrene, 2,4,6-trinitrotoluene, 1,3,5-trinitrobenzene, HMX, RDX, and amino-DNTs were detected at maximum

concentrations of 0.11 mg/kg,<sup>1</sup> 0.22 mg/kg, 0.2 mg/kg, 140 mg/kg, 3.5 mg/kg, and 0.27 mg/kg, respectively. PAHs exceeded USEPA Region III residential screening criteria and were, therefore, retained as contaminants of potential concern (COPCs). Explosives concentrations did not exceed USEPA residential screening criteria. As a result, they were not retained as human health COPCs.

The inorganic constituents cadmium, chromium, copper, iron, lead, mercury, selenium, silver, vanadium, and zinc were detected in Site 22 surface soils at concentrations exceeding base-wide background concentrations. These contaminants were retained as COPCs for Site 22.

In July 2000, surface soil samples were collected throughout WPNSTA and analyzed for dioxins and dibenzofurans. Site 22 was identified as a candidate site for dioxin analysis because of the past waste disposal activities (open burning). Four surface soil samples were collected from Site 22 in areas that could have been affected by open burning. Results for Site 22 dioxin/dibenzofuran analyses were similar to base-wide background results. Site 22 results were also below the Agency for Toxic Substances and Disease Registry environmental media evaluation guide value of 50 parts per trillion, which indicates that the levels of dioxin detected are unlikely to cause adverse human health or environmental effects following exposure.

#### 2.5.2 Subsurface Soil

Explosives, including 2,4,6-trinitrotoluene, HMX, and RDX, were detected in Site 22 subsurface soil samples. These contaminants were detected at maximum concentrations of 0.1 mg/kg,<sup>2</sup> 7.5 mg/kg, and 0.77 mg/kg,<sup>3</sup> respectively. These concentrations were below corresponding USEPA Region III residential screening criteria and these contaminants were, therefore, not retained as human health COPCs.

Inorganic contaminants were also detected in Site 22 subsurface soil samples. Contaminants, including chromium (56 mg/kg<sup>4</sup>), iron (105,000 mg/kg), lead (33 mg/kg), and vanadium (115 mg/kg<sup>5</sup>) exceeded base-wide background levels and USEPA Region III residential screening criteria. These inorganics were retained as COPCs.

<sup>2</sup> Value is estimated.

2-6

<sup>&</sup>lt;sup>1</sup> Value is estimated.

<sup>&</sup>lt;sup>3</sup> Value is estimated.

<sup>&</sup>lt;sup>4</sup> Value is estimated, biased high.

<sup>&</sup>lt;sup>5</sup> Value is estimated.

#### 2.5.3 Summary

After COPCs were identified for surface and subsurface soil at Site 22, a site conceptual model was developed. The site conceptual model of potential exposure is presented in Figure 2-4. The model presents sources of contamination, potential release mechanisms, pathways for exposure, and potential receptors that could be affected under current site conditions.

During the summer 2002 NTCRA, confirmatory soil samples were collected from the walls and floors of the excavated areas. Soil samples were analyzed for the contaminants of concern, and none of the contaminants were detected at levels above their remediation levels. The closeout report for this removal action documents the analytical results of the confirmatory sampling (Shaw, 2003).

#### 2.6 Current and Potential-Future Land and Resource Uses

Because the mission for WPNSTA Yorktown is to sustain war-fighting capabilities for all branches of the armed services, activities and land use at WPNSTA Yorktown are largely industrial. Site 22 is within the restricted area of the WPNSTA, and human access is limited. In addition, this site also falls within the explosives safety quantity distance (ESQD) arc, which is also a restricted area. The ESQD arc estimates the area that would be affected in the event of an uncontrolled detonation of stored munitions. The Navy prohibits development of areas falling within the ESQD arc, and a restricted area surrounding ESQD arcs, for office space or residential use.

#### 2.7 <u>Summary of Site Risks Before Soil Removal</u>

Before the 2002 NTCRA, a baseline risk assessment (RA) was conducted for Site 22. A baseline RA estimates what risks the Site might pose if no action is taken, and it provides the basis for taking remedial action at the Site. Both human health and ecological RAs were conducted at Site 22, and this section provides a brief summary of these RAs and identifies the contaminants and exposure pathways that needed to be addressed by the remedial action.

Human health risks are described by evaluating noncarcinogenic (systemic) and carcinogenic health effects. Reference dose (RfD) values developed by USEPA indicate the exposure dose at which the potential for adverse noncarcinogenic health effects exists from contaminants of potential concern. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. RfDs are derived from human epidemiological data or animal studies to

which uncertainty factors have been applied to account for the use of animal data to predict effects on humans. These uncertainty factors help to ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with an RfD for a similar exposure period. The ratio of exposure to the RfD is called a hazard quotient (HQ). HQ values are then summed to produce hazard indices (HIs) for each potential receptor and means of exposure (dermal, ingestion, inhalation). If an HI is greater than or equal to 1.0, the contaminants included in the HI are re-examined to see whether they affect the same target organ (e.g., liver). If they do, HIs are computed, summing HQ values only for contaminants that affect a single target organ. Contaminants that affect a single target organ and produce an HI greater than or equal to 1.0 are determined to be contaminants of concern (COCs), and remedial action is considered to reduce the risk of adverse, noncarcinogenic health effects in the exposed population.

Carcinogenic human health risks are expressed as a probability known as the incremental lifetime cancer risk (ILCR). This risk is the probability that an individual will develop cancer in his or her lifetime following exposure to a contaminant. These risks are usually expressed in scientific notation. An incremental lifetime cancer risk of lx10<sup>-6</sup>, for example, indicates that an individual who receives an estimated reasonable maximum exposure to contaminants has one chance in a million of developing cancer as a result. This is referred to as an "incremental lifetime cancer risk" because it would be in addition to the risks of cancer that individuals face from other causes (for example, smoking). ILCR values for all potentially carcinogenic COPCs to which a person may be exposed are added together to produce a total ILCR value. The total ILCR value is compared with USEPAs acceptable risk range of 1x10<sup>-6</sup> to 1x10<sup>-4</sup>. The acceptable risk range is the range of cancer risks considered to be acceptable at most sites under most circumstances. For example, the upper end of USEPA's acceptable risk range, 1x10<sup>-4</sup>, means that one additional cancer case is estimated to occur in an exposed population of 10,000 as a result of exposure to the Site. It can also mean that an individual with an ILCR value of 1x10<sup>-4</sup> has an estimated increased probability of 0.01 percent of developing cancer (over the course of a lifetime) following exposure. ILCR values of 1x10<sup>-4</sup> or greater are evaluated to identify those contaminants in environmental media responsible for 95 percent of the unacceptable risk. These chemicals are considered to be COCs and remedial action is considered to reduce the cancer risk.

Because WPNSTA Yorktown was placed on the NPL, in part, as a result of ecological concerns (proximity to wetlands, etc.), potential ecological receptors are also evaluated at each site. Terrestrial and

aquatic receptors are evaluated using a weight-of-evidence approach which consists of two phases: a general comparison to existing toxicity criteria and conservative contaminant uptake modeling to establish a site-specific body burden in an animal receptor and a comparison to published toxicity data for a similar animal. Both phases of the ecological RA culminate with the calculation of ecological HQs. Ecological HQ values equal to or greater than one indicate the potential for adverse effects on the environment. Chemicals producing HQs equal to or greater than one in both phases of the weight-of-evidence approach are considered ecological COCs pending a comparison to base-wide background levels. Remediation of these contaminants must, however, be considered carefully, so that the selected remedy does not create more short-term harm to ecological receptors than would be produced by leaving contaminants in place. That is, scientists must decide if more damage will be done by removing soil, thereby altering the existing habitat, or by having contaminants remain in the soil.

#### 2.7.1 Human Health Risk Assessment

Surface soil, subsurface soil, groundwater, surface water, and sediment were evaluated in the human health RA. Only risks associated with soil collected from Site 22 will be presented in this ROD. Groundwater, surface water, and sediment will be addressed as a separate ROD in the future.

Both current-potential and future-potential human exposure scenarios were evaluated at Site 22. Because the Site falls within the restricted area of WPNSTA Yorktown, the potential for current human exposure is limited. Site 22 is within the ESQD arc, which is associated with the storage of munitions inside the restricted area of WPNSTA Yorktown. Residential development is not permitted in this area. Current- and future-potential human receptors evaluated in the baseline human health RA for Site 22 include:

- Current Adult On-Base Trespassers
- Current Adolescent On-Base Trespassers (7 to 15 years old)
- Current Commercial/Industrial Workers
- Future Adult On-Base Residents
- Future Adolescent Resident Children (7 to 15 years old)
- Future Younger Resident Children (1 to 6 years old)
- Future Adult Construction Workers

Potential receptors were selected based on available information concerning base activities and all foreseeable potential future land-use scenarios including future residential property use at Site 22.

The current adult and adolescent trespasser scenario, although unlikely, assumes that WPNSTA personnel and adolescent children (family members) could trespass during recreational activities. The exposure potential was assumed to be 26 occurrences per year for 9 years for adolescent children. Adult trespasser exposure could occur 26 days per year for 30 years. This estimate is conservative because current property use restrictions prohibit this type of exposure at Site 22.

Potential on-base trespassers include WPNSTA personnel and family members who may access the Site for recreational purposes. Potential exposure to the contaminated media for these potential current receptors includes accidental ingestion of and dermal contact with surface soil. Total risks were estimated by site for the current potential trespassers using the concept of reasonable maximum exposure, which is the highest exposure that is reasonably expected to occur at a site and, in practice, is estimated by combining upper bound (90<sup>th</sup> and 95<sup>th</sup> percentile) values (USEPA, 1989).

Future residential development is unlikely at Site 22 because it falls within the restricted area of WPNSTA. However, the future on-base adult, adolescent, and young child resident scenarios were evaluated to address all types of potential exposure and to provide a conservative estimate of future human risk. Future adult and child residents were evaluated for potential exposure to surface soil by ingestion of and dermal contact with COPCs. Exposure frequency for surface soil of 350 days per year was used with durations of 24 years for the adult, 9 years for the adolescent, and 6 years for the child resident.

Commercial/industrial workers and future construction workers were also evaluated at Site 22. Future commercial/industrial workers were evaluated for potential exposure to surface soil (0 to 6 inches), and future construction workers were evaluated for potential exposure to subsurface (6 inches below ground surface and below) soil. An exposure frequency for soil of 250 days per year was used for all worker exposure scenarios. Exposure durations of 25 years and 1 year were used for commercial/industrial workers and construction workers, respectively.

For each exposure route and potentially exposed population, ILCR values and HI values were calculated to quantify potential risks. The following subsections present a summary of risks (i.e., ILCR values greater than  $1 \times 10^{-4}$  and HI values greater than or equal to 1.0) for potential human receptors.

Cancer Slope Factor (CSF) and RfD values used to estimate potential human health risks are presented in Table 2-1. These toxicity criteria have been extracted from the most recent USEPA databases (e.g., IRIS)

and other USEPA reference material (e.g., Environmental Criteria Assessment Office or Health Effects Assessment Summary Tables). CSF and RfD values are combined with estimates of potential exposure to produce ILCR and HI values for exposed populations.

Tables 2-2 and 2-3 present the surface and subsurface soil COPCs evaluated in the human health RA for Site 22.

#### 2.7.1.1 <u>Current Receptors</u>

Table 2-4 presents total ILCR and HI values for the current adult and adolescent on-base trespassers as well as current commercial/industrial workers. Carcinogenic risks for all current potential human receptors at Site 22 fall within the USEPA acceptable risk range of  $1x10^{-6}$  to  $1x10^{-4}$ .

HI values exceed 1.0 for both adult and adolescent on-base trespassers. The inorganic contaminants chromium, iron, and vanadium produce these elevated HIs. However, these contaminants affect different target organs and their individual HQs, which do not exceed 1.0, should not be summed. In addition, the HI value for a commercial/industrial worker is below 1.0. Unacceptable noncarcinogenic human health effects are not expected to occur at Site 22 under current exposure conditions.

#### 2.7.1.2 Future Receptors

Table 2-5 presents total ILCR and HI values for potential future residents and future construction workers at Site 22. ILCR values for each potential human receptor fall within the USEPA acceptable risk range.

HI values, however, exceed 1.0 for each future potential receptor evaluated at Site 22. An evaluation of the HI derived for younger resident children indicates that aluminum, arsenic, chromium, and iron are responsible for approximately 65 percent of the total HI value. Of these contaminants, only iron produces an HQ value exceeding 1.0 (1.43). Iron was detected at a maximum concentration of 31,900 mg/kg in Site 22 surface soil. The maximum detected iron concentration was lower than the base-wide background concentration of 46,400 mg/kg. Iron was not evaluated as a chemical of concern because the USEPA does not generally require cleanup below natural background levels. Arsenic, aluminum, and chromium have individual HQs below 1.0 and affect different target organs. Therefore, adverse noncarcinogenic health effects are not expected from these contaminants. Table 2-6 shows the breakdown of the HQs by contaminant for younger resident children.

#### 2.7.2 Ecological Risk Assessment

The objective of the ecological risk assessment is to determine whether past site operations have adversely affected the ecological integrity of the terrestrial community at Site 22. A weight-of-evidence approach is used. Contaminant concentrations are first compared to published toxicity information (Phase I) and then evaluated by mathematical models to evaluate whether significant risk is posed by the contaminants to the environment (Phase II).

The ecological RA is comprised of three general sections: exposure assessment, effects assessment, and risk characterization. The following paragraphs present the ecological RA for Site 22. Because this ROD pertains to surface and subsurface soil, only those risks posed to terrestrial ecological receptors will be presented.

#### 2.7.2.1 Exposure Assessment

Ecological receptors were identified by evaluating site conditions and by recommendations from USEPA Region III Biological Technical Assistance Team representatives. In addition to general surface soil flora and fauna, the following terrestrial ecological receptors were evaluated at Site 22:

- American Woodcock (Scolopax minor);
- Red-Tailed Hawk (Buteo jamaicensis);
- American Robin (*Turdus migratorius*);
- Bobwhite Quail (*Colinum virginianus*);
- Marsh Wren (Cistothorus palustris);
- Red Fox (*Vulpes vulpes*);
- Short-Tailed Shrew (Blarina brevicauda);
- Meadow Vole (Microtus pennsylvanicus); and
- Deer Mouse (*Peromyscus maniculatus*).

There are no rare, endangered, or threatened species, as designated by the Commonwealth of Virginia or the federal government, present at Site 22. Although Site 22 lies in the Felgates Creek watershed, no surface water bodies are directly associated with this site.

Three general terrestrial habitat types are present at Site 22. These habitats include open field, mixed forest, and upland forest. The open field is a sparse mix of grasses and perennial plants. The open field is

surrounded by mixed forest to the north and upland forest to the east. Upland forest habitat is dominated by white oak (*Quercus alba*), tulip poplar (*Liriodendron tulipifera*), hickory (*Carya*, sp.), and beech (*Fagus grandifolia*).

Complete exposure pathways for terrestrial receptors include the ingestion of surface soil, plants, and prey species that may contain concentrations of site related contaminants. To estimate the potential intake of contaminants, conservative contaminant uptake models were used that consider site use and receptor behavior. For example, 100 percent of the receptor's home range was assumed to occur at Site 22. The most conservative estimates of receptor body weight were obtained from USEPA's Wildlife Exposure Factors Handbook (USEPA, 1993a). Dietary composition information was obtained from available scientific literature for each receptor species. Food intake was estimated from data provided in the Wildlife Exposure Factors Handbook using the highest of reported body weights (USEPA, 1993a). The contaminants were assumed to be 100 percent available for uptake.

Receptor species were selected to represent different levels of the food chain. Organisms that are likely to be exposed to contaminants because of specific behaviors, patterns of habitat use, or feeding habits were selected for quantitative evaluation in this ecological RA. These species were selected because of their presence on site or their importance in the food chain or because the habitat on or near the Site can support these species.

#### 2.7.2.2 Effects Assessment

There are two types of ecological endpoints: (1) assessment endpoints and (2) measures of effect (USEPA, 1998). Assessment endpoints are environmental characteristics that, if significantly affected by the presence of contaminants in environmental media, would indicate a need for remediation (e.g., decrease in sports/fisheries). Measures of effect may be a measure or an indication of direct toxicity (i.e., results of toxicity tests or comparisons to toxicity criteria).

Table 2-7 presents assessment endpoints, measures of effect, risk hypotheses, and receptor species selected for terrestrial assessment at Site 22.

#### 2.7.2.3 <u>Risk Characterization</u>

Table 2-8 presents the ecological COPCs for Site 22. PAHs exceeded conservative flora and fauna toxicity data. Explosives compounds, including 2,4,6-trinitrotoluene and HMX, were also considered to

be COCs at Site 22, despite that no flora or fauna toxicity data are available for comparative purposes. Inorganics including aluminum, cadmium, chromium, copper, iron, lead, silver, vanadium, and zinc also exceeded flora and fauna toxicity values. Under site-specific exposure scenarios, aluminum, arsenic, cadmium, chromium, copper, lead, vanadium, and zinc produced HQ values greater than one, suggesting that adverse effects may occur to one or more terrestrial receptors.

Surface soil concentrations of PAHs and the inorganic contaminants aluminum, arsenic, chromium, iron, and vanadium fall within the range of base-wide background surface soil concentrations. The EPA generally does not require cleanup below natural background levels. HMX, cadmium, copper, lead, silver, and zinc were, therefore, retained as COCs for Site 22.

#### 2.7.3 Summary of Baseline Risk Assessment Results

During the RI, there were no unacceptable human health risks associated with Site 22 under current- or future-potential exposure scenarios. However, HMX, cadmium, copper, lead, silver, and zinc in surface soil posed unacceptable health threats to terrestrial ecological receptors. Removal of soil at Site 22 was, therefore, necessary to protect the environment.

Remediation levels protective of terrestrial ecological receptors were developed based on the ecological risk assessment. The mean concentration of silver in soil at Site 22 (0.75 mg/kg) was below the remediation level of 2.1 mg/kg. In addition, silver was detected in only 3 of 26 samples at Site 22 (at concentrations of 0.65, 1.2, and 11.8 mg/kg). The range and frequency of detection at this Site indicated that no cleanup of silver was necessary. In addition, the maximum detection of zinc (160 mg/kg) is below the cleanup level of 410 mg/kg generally accepted by the Yorktown Partnering Team. Therefore, only soil contaminated with HMX, cadmium, copper, and lead required removal.

Contaminated soil exceeding remediation levels was removed from Site 22 during the summer of 2002. Table 2-9 provides the soil remediation levels for the COCs posing unacceptable risk to ecological receptors. Carcinogenic PAHs were not identified as a COC; however, to remain consistent with Site 4, soil contaminated with cPAHs exceeding the remediation level of 1 mg/kg were removed. Confirmation sampling of soil was conducted as part of the removal; this sampling confirmed that risks to ecological receptors are no longer present at the Site.

#### 2.8 <u>Documentation of Significant Changes</u>

The proposed plan was released for public comment in January 2001. It identified cleanup of soil contamination to industrial levels as the preferred alternative. Before preparation of a final ROD for Site 22, the Navy determined that it was feasible to excavate soil to levels that are acceptable for all land uses, which would in turn negate the need for a land use restriction at Site 22. Although a final remedy of excavation to acceptable ecological levels, coupled with off-site disposal, differs from the remedy presented in the PRAP, the difference is not fundamental and was foreseeable by the public. To hasten the speed with which the Site was cleaned up, the Navy further decided to proceed with the work as a NTCRA. Therefore, after completion of the NTCRA and confrmatory sampling, this ROD is being issued as no further action.

#### 3.0 RESPONSIVENESS SUMMARY

During the public comment period, written comments, concerns, and questions were solicited. A public meeting was held on February 21, 2001, at the Charles E. Brown Community Building to formally present the Draft PRAP and to answer questions and receive comments. The transcript of this meeting is presented in Appendix A of this ROD. No comments beyond clarifying questions were received at the public meeting or during the public comment period.

#### 3.1 Overview

At the time of the public meeting on February 21, 2001, the Navy had endorsed a preferred alternative in the PRAP for the cleanup of soil contaminated with HMX and inorganics to industrial levels plus restricted land use at Site 22 at WPNSTA Yorktown. The alternative required excavation of contaminated soil at concentrations above corresponding remediation levels (Table 2-9) and the restoration of the excavated area. The excavated soil from the Site would be transported off-site to an approved disposal facility. Members of the community asked questions about this approach to which the Navy responded. During the meeting, USEPA Region III and the Commonwealth of Virginia concurred with the preferred alternative for Site 22. The community offered no comment, at the public meeting or in writing, in opposition to the selection of the preferred alternative.

Before preparation of a final ROD for Site 22, the Navy determined that it was feasible to excavate soil to levels that are acceptable for all land uses, which would in turn negate the need for a land use restriction at Site 22. To hasten the speed with which the Site was cleaned up, the Navy further decided to proceed with the work as a NTCRA. The Navy informed the public of its intent to undertake the NTCRA, and the progress of the removal action, during RAB meetings that were held quarterly in 2002. The WPNSTA RAB is comprised of state and federal agency representatives, technical and business people, and members of the community at large. No negative comments were received from members of the RAB regarding the NTCRA.

#### 3.2 <u>Background on Community Involvement</u>

Nearby communities have a good working relationship with WPNSTA Yorktown because it maintains a "good neighbor" policy through the Public Affairs Office. WPNSTA Yorktown participates in community events and celebrations to foster close ties with the community. As part of the ongoing Community Relations Program (CRP), community interviews were conducted in 1991 to inform the

community of the Installation Restoration Program and solicit feedback on the listing of WPNSTA Yorktown as an NPL site. During these interviews, the community expressed concern about three issues: water resources, cleanup funding, and information availability/validity. This public openness has been maintained by the Public Affairs Office and the Environmental Directorate at WPNSTA Yorktown through the CRP and resulted in the formation of the RAB. The RAB meets regularly, and progress at sites such as Site 22 is discussed from the work plan stage to selection of the remedial alternative (if necessary). Preliminary RI results for Site 22 have been discussed at RAB meetings. Removal activities at Site 22 were discussed during the September 5, 2001 RAB meeting and in 2002.

#### 3.3 Summary of Comments Received During the Public Comment Period

The public comment period on the PRAP began on January 21, 2001 and ended on March 6, 2001. No comments were received from the public during the public comment period.

#### 4.0 REFERENCES

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#### **TABLE 2-1**

#### HUMAN HEALTH RISK ASSESSMENT TOXICITY CRITERIA

#### SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Oral	Inhal.	Oral	Inhal.	Dermal		
	CSF	CSF	RfD	RfD	Absorption	USEPA	
Constituent	(mg/kg/day) <sup>-1</sup>	(mg/kg/day) <sup>-1</sup>	(mg/kg/day)	(mg/kg/day)	Values	WOE	Target Organ/Critical Effect
SVOCs							
Benzo(a)anthracene	7.3E-01				50%	В	
	(e)						
Benzo(b)fluoranthene	7.3E-01				50%	В	
	(e)						
Benzo(a)pyrene	7.3				50%	В	
	(i)						
Chrysene	7.3E-2				50%	В	
	(e)						
Indeno(1,2,3,-cd)pyrene	7.3E-01				50%	В	
	(e)						
n-Nitroso-di-n-propylamine	7.0			_	50%	В	
	(i)						
Inorganics							
Aluminum			1.0	1.0E-03	20%		
			(e)	(e)			
Arsenic	1.5	15.1	3.0E-04		95%	A	Skin/Keratosis, Hyperpigmentation
	(i)	(i)	(i)				
Cadmium		6.30	1.0E-03		2.5% soil	В	Kidney proteinuria
		(i)	(i)				
Chromium		41.0	3.0E-03	3.0E-05	100%	A	Stomach and Nasal Mucosa/Ulceration
		(h)	(i)	(i)			
Copper			4.0E-02		60%	D	Gastrointestinal System/Irritation
			(e)				
Iron			3.0E-01		20%	D	Cardiac Dysfunction and Failure
			(e)				
Lead						В	CNS/Learning, Motor Skills
Manganese			2.0E-02	1.43E-05	5%	D	CNS, Lung/Adverse Effects
			(i)	(i)			

#### **TABLE 2-1 (continued)**

#### HUMAN HEALTH RISK ASSESSMENT TOXICITY CRITERIA

#### SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

Constituent	Oral CSF (mg/kg/day) <sup>-1</sup>	Inhal. CSF (mg/kg/day) <sup>-1</sup>	Oral RfD (mg/kg/day)	Inhal. RfD (mg/kg/day)	Dermal Absorption Values	USEPA WOE	Target Organ/Critical Effect
Thallium			7.0E-05		20%		Liver, Blood, Increased Enzymes
			(o)				
Vanadium			7.0E-03		20%	D	Whole Body/Adverse Effects
			(h)				

#### **Notes:**

 $7.3E-01 = 7.3x10^{-01}$ 

i Integrated Risk Information System (USEPA, 1999a)

e Environmental Criteria and Assessment Office (USEPA, 1999b, as cited in RBC Tables)

h Health Effects Assessment Summary Tables (USEPA, 1997)

Other USEPA documents (USEPA, 1997, as cited in RBC Tables)

-- Not Available

CNS Central Nervous System
CSF Cancer Slope Factor

RfD Reference Dose

WOE Weight of Evidence for Carcinogenicity:

A Human carcinogen

B Probable human carcinogen

C Possible human carcinogen

D Not classifiable as a human carcinogen

E Evidence of noncarcinogenicity

#### TABLE 2-2

#### ${\bf SURFACE\ SOIL\ DATA\ AND\ COPC\ SELECTION\ SUMMARY}$

### SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Region III Criteria <sup>(2)</sup>	Contaminant Frequency/Range <sup>(3)</sup>		Comparison to Criteria	Background <sup>(4)</sup>	COPC Seletion
Contaminant <sup>(1)</sup>	Residential COC Value (mg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections (mg/kg)	Positive Detects Above Residential COC Value	Range of Positive Detections (mg/kg)	Selected as a COPC?
Semivolatiles						
N-Nitroso-di-n-propylamine	0.091	1/26	0.25J	1	NA	Yes
2-Methylnaphthalene	160	1/26	0.05J	0	NA	No
2,6-Dinitrotoluene	7.8	1/26	0.3J	0	NA	No
Phenanthrene	160 <sup>(5)</sup>	4/26	0.044J-0.06J	0	NA	No
Di-n-butylphthalate	780	1/26	0.048J	0	NA	No
Fluoranthene	310	7/26	0.048J-0.2J	0	NA	No
Pyrene	230	9/26	0.041J-0.24J	0	NA	No
Benzo(a)anthracene	0.88	4/26	0.054J-0.1J	0	NA	Yes <sup>(6)</sup>
Chrysene	88	4/26	0.062J-0.2J	0	NA	Yes <sup>(6)</sup>
Bis(2-ethylhexyl)phthalate	46	3/26	0.056J-0.1J	0	NA	No
Benzo(b)fluoranthene	0.88	6/26	0.039J-0.39	0	NA	Yes <sup>(6)</sup>
Benzo(k)fluoranthene	8.8	3/26	0.042J-0.13J	0	NA	Yes <sup>(6)</sup>
Benzo(a)pyrene	0.088	3/26	0.056J-0.11J	1	NA	Yes
Indeno(1,2,3-cd)pyrene	0.88	3/26	0.047J-0.16J	0	NA	Yes <sup>(6)</sup>
Benzo(g,h,i)perylene	230 <sup>(7)</sup>	3/26	0.047J-0.14J	0	NA	No
Pesticides						
Beta-BHC	0.35	1/26	0.0044	0	NA	No
Heptachlor epoxide	0.07	7/26	0.0017J-0.015J	0	NA	No
Dieldrin	0.04	2/26	0.001J-0.0028J	0	NA	No
4,4'-DDE	1.9	6/26	0.0008J-0.0025J	0	NA	No
4,4'-DDT	1.9	5/26	0.0019J-0.0041J	0	NA	No

#### TABLE 2-2 (continued)

### SURFACE SOIL DATA AND COPC SELECTION SUMMARY SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Region III Criteria <sup>(2)</sup>		ntaminant ency/Range <sup>(3)</sup>	Comparison to Criteria	Background <sup>(4)</sup>	COPC Seletion
Contaminant <sup>(1)</sup>	Residential COC Value (mg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections (mg/kg)	Positive Detects Above Residential COC Value	Range of Positive Detections (mg/kg)	Selected as a COPC?
Alpha-chlordane	1.8 <sup>(8)</sup>	5/26	0.00043J-0.0041	0	NA	No
Gamma-chlordane	1.8 <sup>(8)</sup>	4/26	0.00055J-0.0044J	0	NA	No
Nitramines/Nitroaromatics						
2,4,6-Trinitrotoluene	21	2/26	0.2-0.22	0	NA	No
HMX	390	5/26	0.77-140	0	NA	No
Amino-DNTs	0.47	1/26	0.27	0	NA	No
RDX	5.8	2/26	0.9-3.5	0	NA	No
1,3,5-Trinitrobenzen	230	1/26	0.2	0	NA	No
Inorganics						
Aluminum	7,800	26/26	3,930-18,700	20	1,960-19,200	Yes
Antimony	3.1	3/4	0.92L-1.6L	0	9.2L-11L	No
Arsenic	0.43	26/26	0.74L-14.6J	26	0.466-63.9	Yes
Barium	550	26/26	9.8-41.2	0	4.2J-80.2	No
Beryllium	16	11/26	0.17L-0.52L	0	0.23J-0.93J	No
Cadmium	3.9	11/26	0.77L-4.8	2	1.3K-1.5	Yes
Calcium+		25/26	372-45,700		39.4J-7,820	No
Chromium	23	26/26	3.1L-31.4K	3	2.6-18.3	Yes
Cobalt	470	24/26	0.97-6.8	0	1J-6.7J	No
Copper	310	26/26	0.98-1,560	1	1.2J-24.4	Yes
Cyanide	160	4/26	0.24-1.4	0	ND	No
Iron	2,300	26/26	3,290-31,900	26	1,440-19,900	Yes
Lead	400 <sup>(9)</sup>	25/26	4.2-1,910	1	6.4-43.1	Yes
Magnesium+		26/26	269-2,250		61.5J-1,610	No

#### **TABLE 2-2 (continued)**

#### SURFACE SOIL DATA AND COPC SELECTION SUMMARY

#### SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Region III Criteria <sup>(2)</sup>	Contaminant Frequency/Range <sup>(3)</sup>		Comparison to Criteria	Background <sup>(4)</sup>	COPC Seletion
Contaminant <sup>(1)</sup>	Residential COC Value (mg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections (mg/kg)	Positive Detects Above Residential COC Value	Range of Positive Detections (mg/kg)	Selected as a COPC?
Manganese	160	26/26	20.6-229L	2	7.6L-491	Yes
Mercury	2.3 <sup>(10)</sup>	2/26	0.04-0.06	0	ND	No
Nickel	160	25/26	2L-11.8	0	3.8J-11.9	No
Potassium+		25/26	253-1,440J		398J-1,640J	No
Selenium	39	8/26	0.36-1.4L	0	0.26L-0.55L	No
Silver	39	3/26	0.65-11.8	0	1J-2.1J	No
Sodium+		23/26	12.7-1,070		13.9J - 115J	No
Vanadium	55	26/26	5.3-52.9J	0	6.1J-34.7J	No
Zinc	2,300	26/26	6.8-160	0	3.2KJ-48.4	No

#### **Notes:**

- (1) Organic concentrations converted to mg/kg; inorganic concentrations reported in mg/kg.
- (2) COC = USEPA Region III COC screening value (USEPA, 1993b, 1999b).
- (3) J = Analyte was positively identified, value is estimated.

K = Estimated value, biased high.

L = Estimated value, biased low.

- (4) Baker, 1995.
- (5) Value for naphthalene used as a surrogate.
- (6) Re-included as COPC because of possible additive effect of carcinogenic polynuclear aromatic hydrocarbons.
- (7) Value for pyrene used as a surrogate.
- (8) Value for chlordane used as a surrogate.
- (9) Action level for residential soils (USEPA, 1994).
- (10) Value for mercuric chloride used as a surrogate.

- = No criteria published

+ = Essential Nutrients

NA = Not Applicable

ND = Not Detected

#### **TABLE 2-3**

### SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Region III Criteria <sup>(2)</sup>	Contaminant	Frequency/Range (3)	Background <sup>(4)</sup>	Comparison to Criteria	COPC Selection
Contaminant (1)	Residential COC Value (mg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections (mg/kg)	Range of Positive Detections (mg/kg)	Positive Detects Above Residential COC Value	Selected as a COPC?
Volatiles						
Acetone	780	1/11	0.48L	NA	0	No
Carbon disulfide	780	1/11	0.006J	NA	0	No
Toluene	1,600	2/11	0.004J-0.005J	NA	0	No
Semivolatiles Bis(2-ethylexyl)phthalate	46	1/11	0.051J	NA	0	No
Pesticides Beta-BHC	0.35	3/11	0.0023J-0.0042	NA	0	No
Delta-BHC	0.1	1/11	0.0012J	NA	0	No
4,4'-DDD	2.7	1/11	0.00038J	NA	0	No
4,4'-DDT	1.9	1/11	0.00051J	NA	0	No
Methoxychlor	39	2/11	0.0011J-0.0027J	NA	0	No
Alpha-chlordane	1.8 <sup>(5)</sup>	1/11	0.00062J	NA	0	No
Gamma-chlordane	1.8 <sup>(5)</sup>	1/11	0.00059J	NA	0	No
Nitramines/Nitroaromatics 2,4,6-Trinitrotoluene	21	1/11	0.1J	NA	0	No
HMX	390	5/11	0.55J-7.5	NA	0	No
RDX	5.8	2/11	0.53J-077J	NA	0	No
Inorganics						
Aluminum	7,800	11/11	7,780-13,300	2,710-28,200	10	Yes
Antimony	3.1	5/11	0.8L-2.8K	8.5L-31.3L	0	No
Arsenic	0.43	11/11	4.9-22.1J	0.23J-42.7	11	Yes
Barium	550	11/11	9.7-27.1	10.6J-66.9	0	No
Beryllium	16	2/11	0.29L-0.66L	0.3J-9.8	0	No
Calcium+		6/11	501J-3,070J	28.9J-233,000		No
Chromium	23	11/11	23.2K-56.5K	5.2L-33.5	11	Yes
Cobalt	470	11/11	0.77-2.8K	0.97J-156	0	No
Copper	310	11/11	4-15.3	2J-15	0	No
Iron	2,300	11/11	21,100-105,000	3,810J-51,100J	9	Yes
Lead	400 <sup>(6)</sup>	11/11	12.5L-33	3.6L-25.5L	0	No

#### **TABLE 2-3 (Continued)**

#### SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY

#### SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Region III Criteria <sup>(2)</sup>	Contaminant	Frequency/Range (3)	Background <sup>(4)</sup>	Comparison to Criteria	COPC Selection
Contaminant <sup>(1)</sup>	Residential COC Value (mg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections (mg/kg)	Range of Positive Detections (mg/kg)	Positive Detects Above Residential COC Value	Selected as a COPC?
Magnesium+		11/11	298-744	136J-2,870		No
Manganese	160	11/11	6.2L-52.5J	3.5J-2,940	0	No
Mercury	2.3 <sup>(7)</sup>	2/11	0.05-0.1	ND	0	No
Nickel	160	11/11	1.3-9.2	4.2J-145	0	No
Potassium+		11/11	454J-1,090J	392J-2,560		No
Selenium	39	2/11	1.2L-1.2L	0.26L-0.75L	0	No
Sodium+		5/11	33.4-58.8	17.2J-2,180		No
Thallium	0.55	3/11	2-2.8	0.44K	3	Yes
Vanadium	55	11/11	38.9J-115J	7.8J-70.3L	3	Yes
Zinc	2,300	11/11	10.3L-29.5	3.6J-330	0	No

#### **Notes:**

- (1) Organic concentrations converted to mg/kg, inorganic concentrations reported in mg/kg.
- (2) COC = USEPA Region III COC screening value (USEPA, 1993b, 1999b).
- (3) L = Estimated value, biased low
  - J = Analyte was positively identified, value is estimated.
  - K = Estimated value, biased high
- (4) Baker, 1995.
- (5) Chlordane used as a surrogate.
- (6) Action level for residential soils (USEPA, 1994).
- (7) Mercuric chloride used as a surrogate.

-- = No criteria published

+ = Essential Nutrients

NA = Not Applicable

ND = Not Detected

#### **TABLE 2-4**

# TOTAL INCREMENTAL LIFETIME CANCER RISK AND HAZARD INDEX VALUES FOR POTENTIAL CURRENT RECEPTORS<sup>(1)</sup> SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

- 0	Site 22			
Receptors (2)	Total ILCR	Total HI		
Adult On-Base Trespasser	3.3 x 10 <sup>-6</sup>	1.5		
Adolescent On-Base Trespasser	4.5 x 10 <sup>-6</sup>	1.9		
Commercial/Industrial Worker	1.6 x 10 <sup>-5</sup>	0.8		

#### Notes:

- (1) Shaded values represent exceedences of USEPA acceptable risk criteria (i.e., ILCR  $> 1 \times 10^{-4}$  and HI  $\ge 1.0$ ).
- (2) Adult and adolescent trespassers could potentially be exposed to COPCs by accidental ingestion and dermal contact with soil, surface water, and sediments. Commercial/industrial workers could potentially be exposed to COPCs by accidental ingestion, dermal contact, and inhalation of fugitive dusts emanating from surface soil.

#### **TABLE 2-5**

# TOTAL INCREMENTAL LIFETIME CANCER RISK AND HAZARD INDEX VALUES FOR POTENTIAL FUTURE RECEPTORS<sup>(1)</sup> SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

<b>D</b> =(2)	Site 22			
Receptors (2)	Total ILCR	Total HI		
Adult On-Base Residents	8.4 x 10 <sup>-5</sup>	1.6		
Adolescent Resident Children	6.1 x 10 <sup>-5</sup>	2.3		
Younger Resident Children	8.2 x 10 <sup>-5</sup>	4.7		
Adult Construction Workers <sup>(3)</sup>	1.9 x 10 <sup>-6</sup>	2.6		

#### Notes:

- (1) Shaded values represent exceedences of USEPA acceptable risk criteria (i.e., ILCR  $> 1 \times 10^{-4}$  and HI  $\ge 1.0$ ).
- (2) Future residents could potentially be exposed to COPCs by accidental ingestion and dermal contact with surface soil.
- (3) Construction workers could potentially be exposed to COPCs by accidental ingestion, dermal contact, and inhalation of dust emanating from subsurface soil.

### **TABLE 2-6**

### RISK CHARACTERIZATION SUMMARY FOR POTENTIAL FUTURE RECEPTORS-NONCARCINOGENS **SITE 22**

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

**Scenario Timeframe:** 6 years

young children **Receptor Population:** Receptor Age: 0 to 6 years

receptor riger visit years											
Medium	Chamical of	Exposure Point Concentrations (mg/kg)	Primary Target Organ	Noncarcinogenic Hazard Quotient							
	Chemical of Concern			Ingestion	Dermal	Inhalation	Exposure Routes Total				
Soil	Aluminum	12,047	NA	0.15	0.11	NE	0.26				
	Arsenic	7.6	Skin	0.33	0.08	NE	0.41				
	Chromium	19.4	NA	0.08	0.83	NE	0.92				
	Iron	22,277	Heart	0.95	0.48	NE	1.43				
					То	tal Hazard Indov	3.02				

Total Hazard Index

Notes:

NE – Not Evaluated

NA – Not Available

### **TABLE 2-7**

# ASSESSMENT ENDPOINTS, RISK HYPOTHESES, MEASUREMENT ENDPOINTS, AND RECEPTOR SPECIES

### **SITE 22**

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor						
TERRESTRIAL ASSESSMENTS									
Protection of insectivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of insectivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing estimated intake by a toxicity value associated with a NOAEL. (1)	Short-Tailed Shrew						
Protection of herbivorous mammals to ensure that ingestion of contaminants in soil and vegetation does not have a negative impact on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of herbivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing estimated intake by a toxicity value associated with a NOAEL.	Meadow Vole						
Protection of omnivorous mammals to ensure that ingestion of contaminants in soil, prey, and forage does not have negative impacts on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of omnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing estimated intake by a toxicity value associated with a NOAEL.	Deer Mouse						
Protection of carnivorous mammals to ensure that ingestion of contaminants in soil and prey does not have a negative impact on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of carnivorous mammals using the site?	Comparison of dietary HQs to a reference of 1.0. Dietary HQs are calculated for individual chemicals by dividing estimated intake by a toxicity value associated with a NOAEL.	Red Fox						
Protection of insectivorous birds to ensure that ingestion of contaminants in soil or food items does not have negative impacts on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of insectivorous birds using the site?	Comparison of dietary HQs to a reference HQ of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated intake by a toxicity value associated with a NOAEL.	American Woodcock and Marsh Wren						
Protection of herbivorous birds to ensure that ingestion of contaminants in soil or vegetation does not have negative impacts on growth, survival, and reproduction.	Are levels of site contaminants in surface soil sufficient to cause adverse effects on the growth, survival, and reproductive success of birds using the site?	Comparison of dietary HQs to a reference HQ of 1.0. Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by a toxicity value that is associated with a NOAEL.	Bobwhite Quail						

### **TABLE 2-7 (Continued)**

# ASSESSMENT ENDPOINTS, RISK HYPOTHESES, MEASUREMENT ENDPOINTS, AND RECEPTOR SPECIES SITE 22

## NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VA

Assessment Endpoint	Risk Hypothesis	Measurement Endpoint	Receptor	
TERRESTRIAL ASSESSMEN				
Protection of omnivorous	Are levels of site	Comparison of dietary HQs to a	American Robin	
birds to ensure that ingestion	contaminants in surface soil	reference HQ of 1.0. Dietary		
of contaminants in soil or	sufficient to cause adverse	HQs are calculated for		
food items does not have	effects on the growth,	individual chemicals by dividing		
negative impacts on growth,	survival, and reproductive	an estimated level of exposure		
survival, and reproduction.	success of birds using the	by a toxicity value that is		
	site?	associated with a NOAEL.		
Protection of carnivorous	Are levels of site	Comparison of dietary HQs to a	Red-Tailed	
birds to ensure that ingestion	contaminants in surface soil	reference HQ of 1.0. Dietary	Hawk	
of contaminants in soil or	sufficient to cause adverse	HQs are calculated for		
food items does not have	effects on the growth,	individual chemicals by dividing		
negative impacts on growth,	survival, and reproductive	an estimated intake by a toxicity		
survival, and reproduction.	success of birds using the	value associated with a		
	site?	NOAEL.		
Protection of mammals	Are levels of site	Comparison of dietary HQs to a	Red Fox	
feeding on prey organisms	contaminants in soil	reference HQ of 1.0. Dietary		
from toxic effects of	sufficient to cause adverse	HQs are calculated for		
site-related chemicals	effects on growth, survival,	individual chemicals by dividing		
present in surface water or	and reproductive success of	an estimated intake by a toxicity		
sediment.	mammals that eat prey	value associated with a		
	species and use the site?	NOAEL.		

Note:

 $<sup>^{(1)}</sup>$  NOAEL – No Observed Adverse Effect Level

# TABLE 2-8 FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO SURFACE SOIL SCREENING LEVELS SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

	Contaminant Frequency/Range						WPNSTA Background	
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Arithmetic Mean (Half Non-Detects)	Value used in screen (1)	Surface Soil Screening Levels (2)	Max HQ <sup>(3)</sup>	Range of Background Concentrations	ECOC?
SEMIVOLATILES (µg/kg)								
N-NITROSO-DI-N-PROPYLAMINE	1/26	250J - 250J	217.88	250	NE	NA	ND	Yes
2-METHYLNAPHTHALENE	1/26	50J - 50J	210.77	50	NE	NA	ND	Yes
2,6-DINTROTOLUENE	1/26	300J - 300J	219.81	300	NE	NA	ND	Yes
PHENANTHRENE	4/26	44J - 60J	193.31	60	4100 (4)(5)	0.01	ND	No
DI-N-BUTYLPHTHALATE	1/26	48J - 48J	210.69	48	200000 (4)(6)	0.00	ND	No
FLUORANTHENE	7/26	48J - 200J	188.73	200	4100 (4)(5)(7)	0.05	120Ј - 430	No
PYRENE	9/26	41J - 240J	179.50	240	100	2.40	160J - 320J	Yes
BENZO(A)ANTHRACENE	4/26	54J - 100J	195.88	100	4100 (4)(5)(7)	0.02	120J - 240J	No
CHRYSENE	4/26	62J - 200J	201.00	200	4100 (4)(5)(7)	0.05	150J - 270J	No
BIS(2-ETHYLHEXYL)PHTHALATE	3/26	56J - 100J	165.31	100	NE	NA	ND	No
BENZO(B)FLUORANTHENE	6/26	39J - 390	200.42	390	100 (4)(5)(7)	3.90	230Ј - 500	Yes
BENZO(K)FLUORANTHENE	3/26	42J - 130J	202.31	130	4100 (4)(5)(7)	0.03	120Ј - 130Ј	No
BENZO(A)PYRENE	3/26	56J - 110J	202.38	110	4100 (4)(5)(7)	0.03	140J - 180J	No
INDENO(1,2,3-CD)PYRENE	3/26	47J - 160J	203.77	160	4100 (4)(5)(7)	0.04	160J - 160J	No
BENZO(G,H,I)PERYLENE	3/26	47J - 140J	202.85	140	4100 (4)(5)(7)	0.03	ND	No
EXPLOSIVES (mg/kg)								
2,4,6-TRINITROTOLUENE	2/26	200 - 220	81.54	220	NE	NA	ND	Yes
HMX	5/26	770 - 140000	6189.23	140000	NE	NA	ND	Yes
AMINO-DNTS	1/26	270 - 270	109.42	270	NE	NA	1.3J - 1.3J	Yes
RDX	2/26	900 - 3500	415.38	3500	NE	NA	ND	Yes
1,3,5-TRINTROBENZENE	1/26	200 - 200	79.42	200	NE	NA	1J - 1J	Yes

#### **TABLE 2-8 (Continued)**

### FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO SURFACE SOIL SCREENING LEVELS SITE 22

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

		Contaminant Frequency/Range					WPNSTA Background	
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Arithmetic Mean (Half Non-Detects)	Value used in screen (1)	Surface Soil Screening Levels (SSSL) (2)	Max HQ <sup>(3)</sup>	Range of Background Concentrations	ECOC?
TOTAL INORGANICS (mg/kg)								
ALUMINUM	26/26	3930 - 18700	10783.85	18700	50 (4)(6)	374.00	1960 - 24100	Yes
ANTIMONY	3/4	0.92L - 1.6L	1.08	1.6	5 (4)(6)	0.32	9.2L - 11L	No
ARSENIC	26/26	0.74L - 14.6J	6.25	14.6	60 (4)(8)	0.24	0.46L - 63.9	No
BARIUM	26/26	9.8 - 41.2	25.17	41.2	500 (4)(6)	0.08	4.2J - 80.2	No
BERYLLIUM	11/26	0.17L - 0.52L	0.16	0.52	10 (4)(6)	0.05	0.23J - 0.93J	No
CADMIUM	11/26	0.77L - 4.8	1.05	4.8	4 (4)(6)	1.20	1.2J - 1.5	YES
CALCIUM	25/26	372 - 45700	4996.81	45700	NE	NA	39.4J-7820	No
CHROMIUM	26/26	3.1L - 31.4K	17.02	31.4	0.4 (4)(8)(9)	78.50	2.6 - 33.5	YES
COBALT	24/26	0.97 - 6.8	2.43	6.8	100 (10)	0.07	0.88J - 6.7J	No
COPPER	26/26	0.98 - 1560	78.80	1560	50 (4)(8)	31.20	1.2J - 24.4	YES
IRON	26/26	3290 - 31900	19656.92	31900	200 (4)(8)	159.50	1440 - 46400	YES
LEAD	25/26	4.2 - 1910	116.79	1910	50 (4)(6)	38.20	2.1 - 43.1	YES
MAGNESIUM	26/26	269 - 2250	922.96	2250	4400	0.51	61.5J-2700	No
MANGANESE	26/26	20.6 - 229L	86.78	229	500 (4)(6)	0.46	7.6L - 491	No
MERCURY	2/26	0.04 - 0.06	0.03	0.06	0.1 (4)(6)	0.60	0.05J - 0.05J	No
NICKEL	25/26	2L - 11.8	5.36	11.8	30 (4)(6)	0.39	3.8J - 12.5	No
POTASSIUM	25/26	253 - 1440J	625.92	1440	NE	NA	387.J-1640J	No
SELENIUM	8/26	0.36 - 1.4L	0.33	1.4	1.8	0.78	0.21L - 0.61L	No
SILVER	3/26	0.65 - 11.8	0.75	11.8	2 (4)(6)	5.90	1J - 2.1J	YES
SODIUM	23/26	12.7 - 1070	183.22	1070	NE	NA	12J-115J	No
VANADIUM	26/26	5.3 - 52.9J	29.97	52.9	2 (4)(6)	26.45	5.2J - 64.7	YES
ZINC	26/26	6.8 - 160	46.96	160	50 (4)(6)	3.20	3.2KJ - 48.4	YES

#### Notes:

ECOC Ecological Contaminant of Concern

HQ Hazard Quotient

J Value Estimated

K Value Biased High

L Value Biased Low

NE Not Established

NA Not Applicable

 $\mu$ g/kg micrograms per kilogram

mg/kg milligrams per kilogram

Shaded area represents ECOCs and highlights

HQ > 1.0.

- (1) Maximum detect value
- (2) USEPA Region III BTAG screening values unless otherwise noted (USEPA, 1995)
- (3) HQ = Value used in Screen/Screening Level
- (4) Screening value for Chlordane
- (5) MHSPE, 1994
- (6) Efroymson, Will, Suter, and Wooten, 1997 (ORNL Terrestrial Plants)
- (7) Screening value for total PAHs
- (8) Efroymson, Will, and Suter, 1997 (ORNL Soil Invertebrates)
- (9) Screening level for Chromium VI
- (10) Value Dependent on pH
- (11) Screening level for Chromium VI
- (12) Value dependent on pH

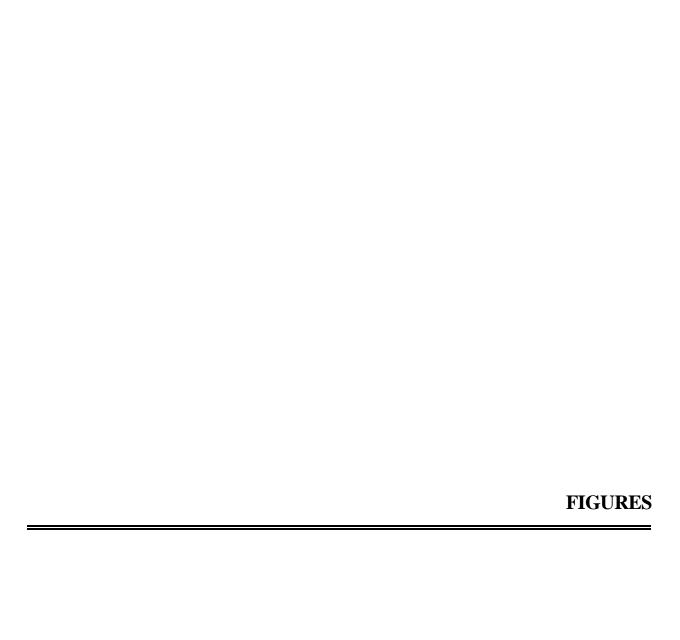
### **TABLE 2-9**

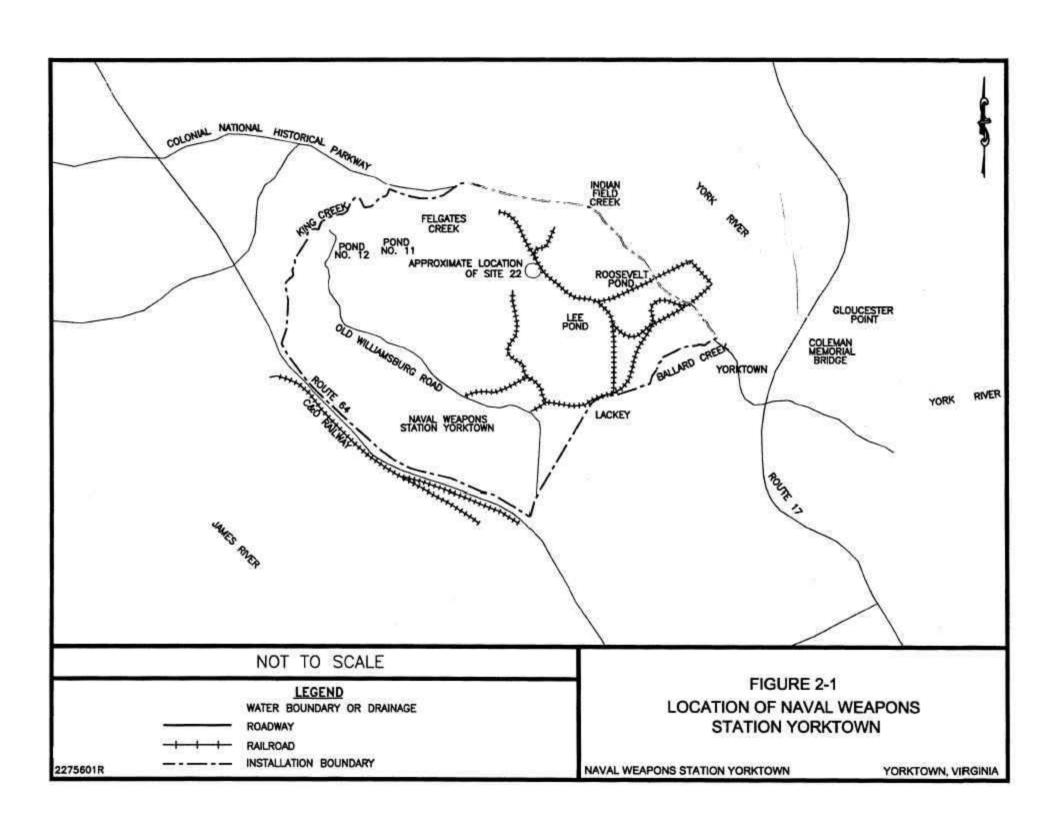
### SELECTION OF REMEDIATION LEVELS SITE 22–SOIL NAVAL WEAPONS STATION, YORKTOWN YORKTOWN, VIRGINIA

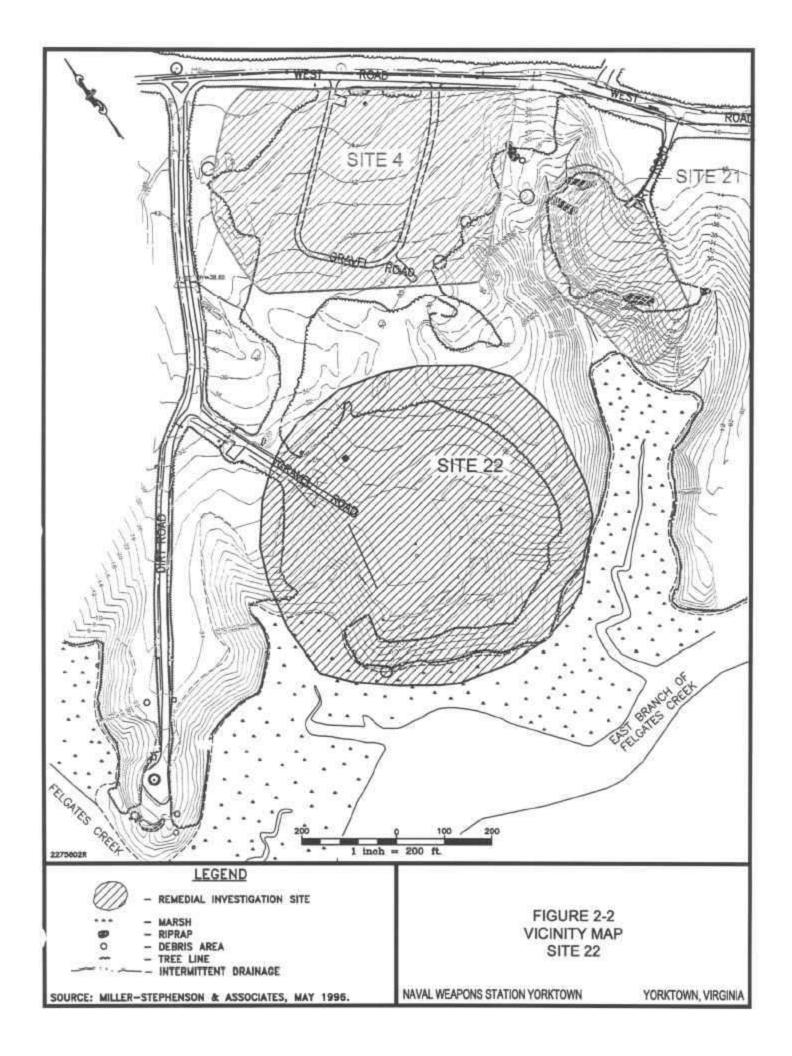
Contaminant	Station-Wide Background (mg/kg)	Human Health PRG (mg/kg)	Ecological Uptake Goal (mg/kg)	Flora Toxicity Benchmark (mg/kg)	Fauna Toxicity Benchmark (mg/kg)	Final Remediation Goal (mg/kg)
cPAHs	NA			NE	NE	<b>1</b> <sup>(1)</sup>
HMX	NA		5.7 <sup>(2)</sup>	NE	50	5.7
Cadmium	1.5		0.9	4	20	4
Copper	24.4		20	100	50	100
Lead	43.1		200(3)	50	500	48.7(4)

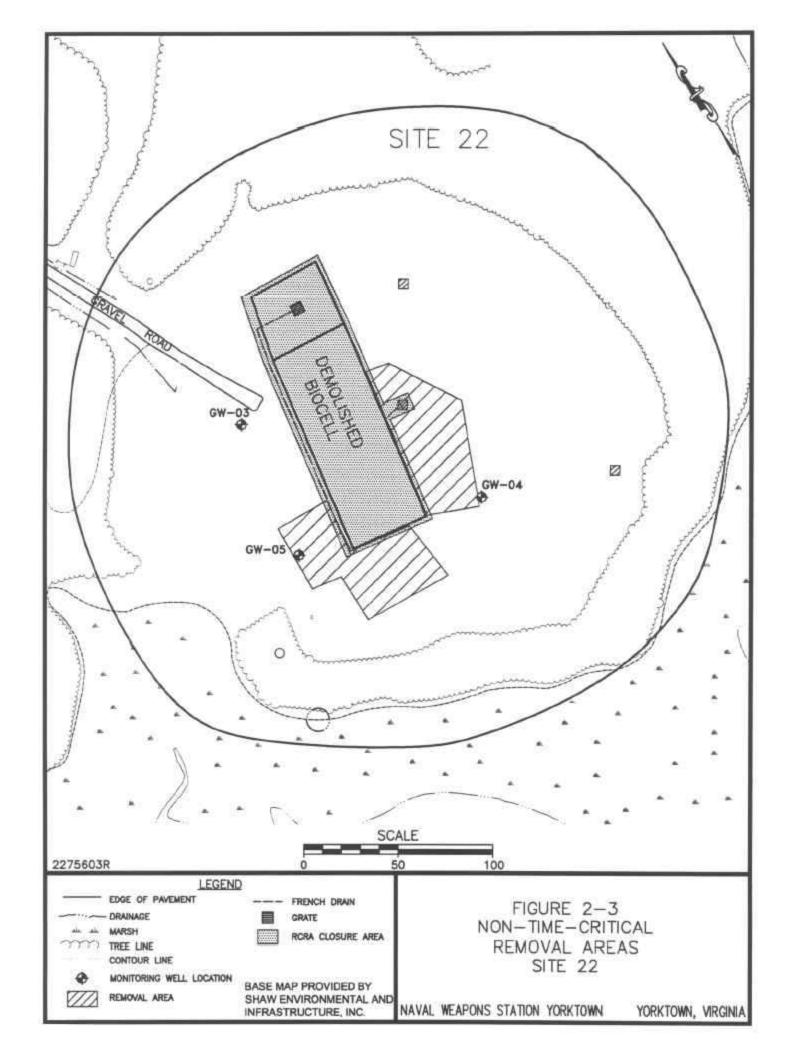
### Notes:

- (1) Derived from Site 4
- (2) Derived from WPNSTA Toxicity Study Site 6
- (3) Effects range medium sediment value applied to soil
- (4) Based on the most sensitive receptor American Robin. Agreed to by Yorktown Partnering Team on January 29, 2002.
- -- Not a contaminant of concern for this receptor
- NA Not applicable
- NE Not established
- PRG Preliminary Remediation Goal







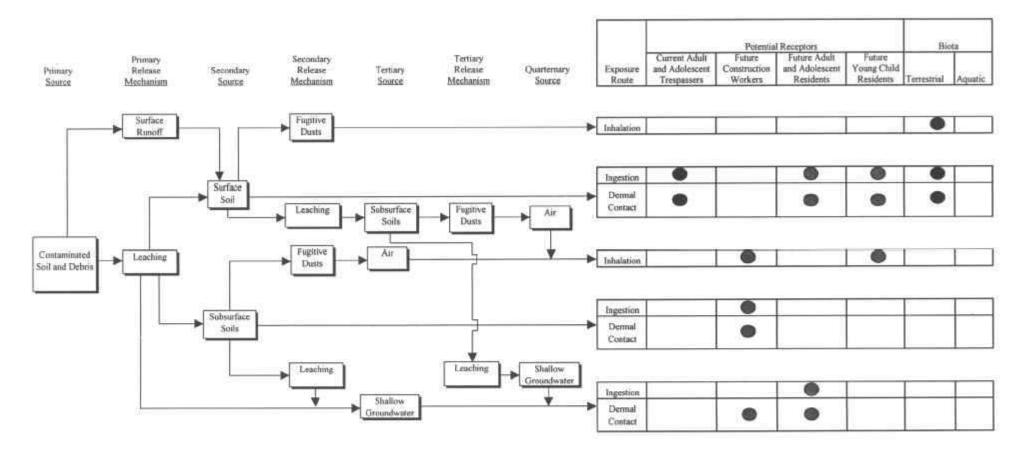


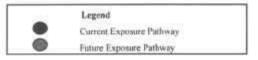
### FIGURE 2-4

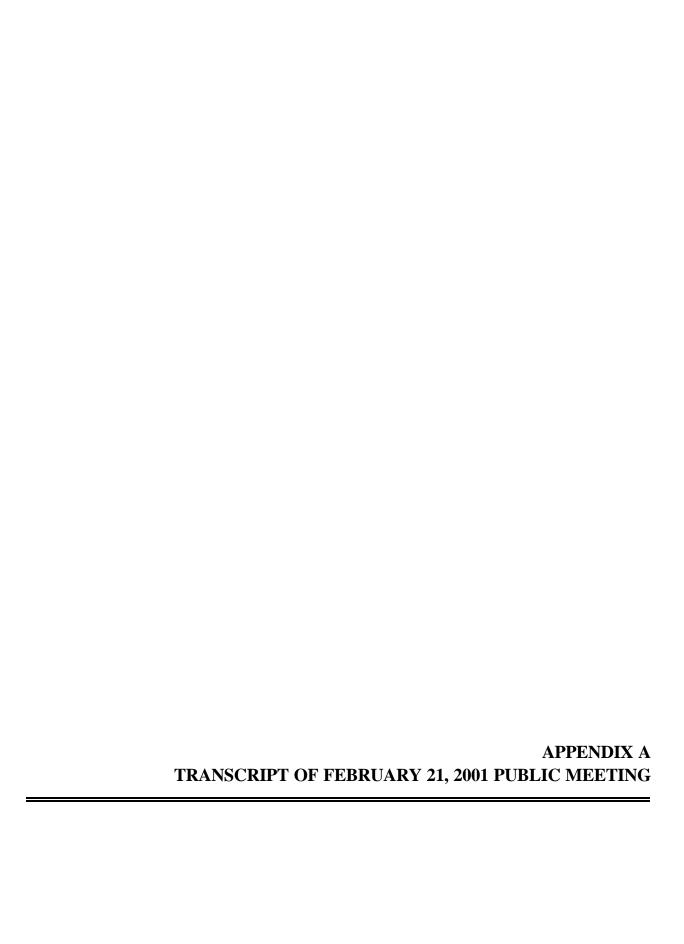
#### CONCEPTUAL SITE MODEL

#### **SITE 22**

### NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA







MS. PHILLIPS: We want to welcome you to our quarterly meeting, and glad everybody could make it out tonight, maybe before the snow comes. If Jeff is short-winded tonight, then maybe that means we're going to get snow. But if he's his usual, we won't get any snow.

Before we get started, I wanted to call your attention -- you might think I wasted my time in sending Petty Officer Varner out to interview these guys, but Petty Officer Varner spent about a day with these guys while they were, quote, working, and she has written this nice article that we got in the booster. We also got it in the Flagship. You have copies of it, I think, in front of you. It's called, Navy Creates Environmentally Clean Dream Team in Yorktown. She was very creative in her title, so I hope you'll enjoy reading that and see the publicity, that we are trying to get these people out there for everyone.

And we'd like to welcome -- I think,
Captain Skudin, this is your second meeting?

CAPTAIN SKUDIN: Yes, ma'am.

MS. PHILLIPS: Nice having you here tonight. Would you like to make any comments?

CAPTAIN SKUDIN: Let it snow, let it

1 snow, let it snow.

2 MS. PHILLIPS: And I'll be waiting here 3 to get the closings to the radio stations.

Jay is our cochair. Do you have comments?

MR. DEWING: No, I don't have any comments. Maybe later.

MS. PHILLIPS: I'm sure you might have some questions a little bit later. Well, tonight we're supposed to begin the meeting with our public meeting on the proposed remedial action plan for sites four, 21, and 22, and so I'll turn it to Rich.

MR. HOFF: Thanks, Kay. Good evening, everyone. I'm glad to see everybody could make it.

Tonight we'll start with a proposed remedial action plan briefing.

The purpose of the plan briefing is to make the public aware that we are in the process of beginning to take some remedial action at these three particular sites. And the reason that we have this meeting is to engage the public and to solicit comments from the public based upon what we discuss this evening regarding our remedial action plan for the sites.

We've talked about these sites a good bit

over the past several RAB meetings. This is nothing new to the members here tonight. And because we don't have anybody from the public, outside of our normal RAB that I see, I think what I'll do is I'll try to be as brief as possible.

Sites four, 21 and 22, these are the sites located within the central to north central portion of the stadium -- not stadium -- you can tell I come from Pittsburgh -- of the station, and they are bounded to the west by Felgates Creek and to the northeast by Main Road.

We have placed maps around the table of the Naval Weapons Station, Cheatham Annex, to give you an idea of the approximate location of the size, and they are located, as I said, in the central portion of the Naval Weapons Station Yorktown along the main branch of Felgates.

These sites reside within the restricted area of the station. Human activity is very limited at these sites. And really our main concern with these sites are potential risk to ecological receptors. As you see and as I go through it, there are very few unacceptable risks identified to human health, and that's because there is such little contact or little opportunity for contact to

contaminants of the soil.

Surprisingly, the contamination of these sites is somewhat low, but that's to be expected because back in 1994-1995 time frame, we did a removal action, a rather large one. I believe it was IT that conducted the removal action. And thousands of tons of debris, contaminated ash, and impacted soils were removed from all of these sites and disposed of off site.

And it was fortunate that we did this because I think it makes the investigation and what we have to do much easier when we don't have to work around large debris piles. And I think it also mitigates probably the greatest extent of the risk as we'll see.

This is a better idea of the location.

This is not a stadium, this is Naval Weapons Station

Yorktown, and, again this is the main branch of

Felgates Creek, the York River. And we're running off

the Main Road, so we're pretty much well away from

anything in terms of human activity at the station.

A little background on Weapon Stations

Yorktown. We became an NPL site in 1992, and we

finalized our federal facilities agreement in August

of 1994. Originally we had identified 16 sites in the

federal facilities agreement, including a list of site screening areas and 21 of RECWA (phonetic) or CERCLA areas of concern. And these were inventoried very early on in the process.

Currently, we have 11 active sites and one site screening area remaining. These are sites under investigation or in various processes of investigation and will soon be in the remedial action stage.

If you follow what we've been doing over the years, we break our sites down into operable units when it comes to remediation, and this is really an accounting practice to keep track of the various sites of how we remediate medially those sites. And by "media," I mean surface soils, sediment, et cetera.

What it allows us to do is take a site and subdivide it, if we need to, to address what we believe are the worst or the most egregious contamination problems.

For instance, we might break the soil away from the groundwater because we feel that we need to take an immediate action on the soil. And by doing that, we greatly simplify the record of decision process and also the public involvement process. I think it's much easier to come in here and talk about

a specific media and the risks that it poses as opposed to multiple media across the site. It becomes very confusing. So this is an accounting practice.

Currently, we have 14 records of decision that have been signed, and they really -- I'm sorry -- numerous RODs signed, but 14 ROD sites and two SSAs have been signed off on, and we are either in the process of construction or we have completed construction.

Site four, 21, and 22 are going to be labeled operable units. And 16, 17, and 18 -- and the way they are grouped here is really a function of how we intend to present the information to the EPA's office of counsel. What we have done is grouped sites four and 22 together. The reason for that is that there are some RECWA concerns regarding those sites.

If you remember site 22 is our burn pad. And site four is an area where ash from the burn pad was stored, so we've combined those sites into a single record of decision to address the RECWA issues that can come about as a result of past activities at site 22.

Site 21, as you'll see, was addressed later in our program. It was identified even after the FFA was completed and was added later. And the

reason being, we had discovered batteries and some debris that was disposed of in the wood line and it became part of the 1994-'95 removal action. There was still some residual contamination remaining in the soil, so we parsed it out and made it site 21.

This is structured pretty much the way we presented it to the EPA's office of regional counsel, so we go right to the heart of the issue. The preferred alternative for site four is excavation of off-site disposal of PAH and inorganic contaminated soils. The type of soil, the volume of soil, the depth of contamination is very conducive to a removal and an off-site disposal.

We've evaluated other alternatives, which I'll talk about a little bit later, but we feel that this combines the best of all worlds, cost, protection of human health, and the environment, permanency of the remedy. And we then intend to confirm that the samples in the area of those removals will be -- there will be confirmatory sampling to determine the contamination has been removed, so we won't leave anything that would cause risk of subsequent exposures. Of course, we'll backfill and bring it to grade and reestablish native plant species, as we've discussed, with our regulatory counterparts.

The preferred alternative for site 21 is very similar. We have some inorganic contaminants in the soil. These are really residual from the removal action of '94-'95. There's no human health problem or threat here, but we have inorganic contamination that would affect receptors in our ecological risk models.

And we do this by looking at individuals and not at populations. We get into ecological risk assessments. There's always the discussion of, does it affect an individual? Does it affect a population? So we're talking a very conservative look at this, and we're saying, we won't worry about population effects. If we have ecological uptake models that indicate risk, we're going to get that stuff out of there. There's only a couple of hundred yards of soil that will have to be removed from site 21 to really write it off, and it will prevent us from having to do any sort of long-term monitoring or institutional controls after the remedial action.

Site 22 is a little different. This is where we have the biocell. And the biocell is now inactive, so we're going to demolish and dispose of the biocell. We will sample accordingly to determine that there's no RECWA hazardous waste left on-site.

Our intent here is to clean close this area so that you don't, again, have to do any long-term monitoring or put any type of property use restrictions in place. Again, we'll do confirmatory sampling to ensure the removal has been effective, and, again, we'll backfill and reestablish native plants.

And I want to stress that groundwater, surface water, and sediment will be addressed as a future operable unit for all of these sites. So this is really a soil remedy.

Just an overview of the proximity of the sites. Again, you have West Road, the biocell -- or the former biocell where we did the simplot work.

Site 21 is a small area just to the east of site 22.

And you've seen this picture many times.

This is a picture of site 22, the burn pad where the explosives -- contaminated materials and some explosive material was burned. This is where the ash pile was. It was located in this area of site four.

And there was miscellaneous debris disposed throughout the site four area that was taken out during the removal action.

That's a more current look at site 22.

This is when the gantry system was in place and the biocell was operational.

This is site 21, and it pretty much looks like this. There's certainly more overgrowth today. This was a very complete removal that was conducted here. Off the top of my head, I believe about 5,000 tons of batteries and miscellaneous debris was removed from the backside and disposed of accordingly. It was a very complete removal action. And the only reason we came back to it was, as I said, there was some residual inorganic contamination and soil.

Brief description. Site four is about a 10-acre area. Number of different disposal options in the past, trench-and-fill style. Again, a great deal of material was removed. Most importantly, probably the ash from site 22 and some of the boiler ash that came out of there, it contained PAHs, residual explosives, compounds, 2, 4, 6 TNT, et cetera, and, of course, inorganics.

And the depth was variable. I think the deepest trenched area we uncovered during the removal action was approximately five feet.

Site 21, again a very small area east of site four. Primarily batteries, that's what we removed and disposed of those accordingly. Not much history on this site. It's one of those that we found as we were working on others, so there isn't a whole

lot of information from a historical perspective on site 21.

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And site 22, again it's well-known that this is where they had burned ordnance, ordnance contaminated materials from the '40s. That continued until approximately 1995. Certainly there was not much burning at that point in time. There were a series of pans that were removed from that area, I think, in 1995, early 1996 before we began to build the biocell.

And, again, we did successfully treat soil from sites seven and 19 to sites that we do have records of decision in that biocell, so we believe that it was a very good project for us. It was certainly the first of our four As into innovative technology, like bioremediation and it certainly provided us with a number of lessons learned.

That's just an aerial photograph to kind of give you some perspective on the location. I think we're a little bit -- we have sites 21 and 22. This is site 22.

This is site 21 hiding back in the tree line here. And this is site four just north of site 22.

I'll discuss in brief some of the

investigations. These are really put here to give some credibility to our decision-making process.

We've been actively involved with these sites for a number of years now, dating back to 1984. And certainly before my time, Baker came on the scene then around 1992, 1993 during the FFA development. And so you can see that we've had numerous investigations at site four.

Site 21, again because it was found a little bit later on in the process, received habitat evaluations, subsequent and removal action, and then a post-removal report in '95. The round II RI is really what pulls this all together.

Site 22 investigations, similarly it did not receive a lot of the initial investigations because it was an active facility. But, again, sampling in the round II RI stage in 1996 -- and, of course, our pilot study where we did the simplot work.

Again, investigations that we really focused on as part of the round II RI and risk assessment was certainly the more recent data. I think the post-removal data was very important. And certainly the round I data that was collected by Baker and WPNSTA. And those were supplemented with

additional soil samples and some groundwater data.

That rounded off our round II RI.

I'll quickly go through the baseline risk assessment. In general when you conduct a baseline assessment we take our analytical data and then we identify chemicals of potential concern, and we do the same for ecological chemicals as well. And this is really a comparative process. We take our maximum detected concentrations in a given media and compare those to EPA criteria. If it concedes, it becomes a chemical of concern, either ecological or human health.

Then once we've done that, we begin to develop exposure pathways. These are the site-specific inputs that we evaluate and we try to, as best we can, determine how humans and receptors, ecological receptors, could be exposed to these contaminants. And these round up into a mathematical model to calculate risk. That risk assessment then provides us for the basis for taking any subsequent remedial action.

Some of the contaminants of concern, not surprisingly the explosives, the PAHs from the burning process and ash, and then, of course, inorganics, which we believe are the result of past practices.

Those inorganics with asterisks behind them indicate that there's probably some background considerations meaning that station-wide background areas of unaffected soil, groundwater, surface water, or sediment may have similar concentrations. So those are chemicals going into the feasibility study we begin to discount, if you will.

The ecological COC are a little different because, again, you have more receptors to consider. In the ecological risk assessment process, we consider everything from the soil, macroinvertebrates, to plants, to flora, and fauna of all types really. And then we also do some food chain modeling to evaluate the effects on deer and the upper trophic levels. And so you get some different contaminants of concern, but these are pretty much similar to the human health.

Of course the TNT, the dinitrotoluenes are rather toxic, and so they make our list, PAHs and then, again, the inorganics.

Site 22, this was primarily the inorganics, and most of these were background with the exception being aluminum. One of the chemicals that was not background, aluminum. And the reason being is we believe this is associated with the ordnance that was burned.

To go over some of the baseline risk assessment results, from the human health perspective, we look at two indices, we look at the incremental lifetime cancer risks, which is the probability that if you are exposed, as our risk assessment says you might be exposed, you have this probability of developing a cancer over the course of your lifetime.

The next index we look at is the hazard index, and that's really a go or a no go decision-making tool. It says if you are exposed to a chemical above a certain threshold, there's the potential for an adverse effect. It doesn't give you any indication of the severity or the magnitude of the effect, only that if you are exposed above this level, there could be an adverse affect.

At site four, we had some exceedences to future residents, and that's because of the PAHs. In particular, the carcinogenic PAHs, benzopyrene -- there's seven of them that we focused on. And these have the potential of causing cancer if ingested.

the dermal exposure to these contaminants because of the pathways. In the risk assessment we do consider the ability of a contaminant to cause a certain effect by the pathway of exposure. And certain chemicals

cause -- or are more likely to cause cancer by certain pathways. PAHs certainly by ingestion.

There is some indication that they can cause cancer through dermal contact. In fact, some of the earliest studies of carcinogenesis involve PAHs. But because of the toxicity factors and the way they are derived, EPA region three says we don't look at the normal pathway.

We also had hazard indices that exceeded one. And that was primarily due to arsenic. We had some very high hits of arsenic in the southern portion of site four.

Site 21, there was really no human health risk. Again, I credit the removal action for this.

We took so many batteries out of that area and so much soil that I think what we had was the very residual of residuals.

Site 22, we were rather surprised. But given the nature of the disposal, it sort of made sense that because you're incinerating explosives, you probably hit some very high temperatures out there.

Many of the organics were destroyed. We also did some dioxin sample of the site. I think we talked about that here a few meetings ago where EPA had requested that we look at the potential for the formation of

dioxin because of the incomplete combustion processes associated with open burning as a means of disposal.

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Again, we took those samples, we submitted them to a laboratory that performs the very high end dioxin analysis. It looked for all of the congeners of dioxins specifically. Very sensitive, very selective method, and we really found very low levels of dioxin, which we were very glad to find. We did not have the levels we expected to find at site 22. So, again, risks to human health at site 22 are rather limited as well.

Ecological is a little bit of a different story. Because we run the uptake models and because a lot of our ecological risk assessment is comparative in nature, there are those PAHs and inorganics which exceed not only background values, but EPA's criteria, so we do have potential ecological risks at site four and both sites 21 and 22.

Based on the results of the risk assessment, what did we think we have to do in terms of remedial action at these particular sites?

Well, we came up with what we call the scope and the role of our remedial action. And really there were two most important points. One is to mitigate the potential for exposure to PAHs of site

four. There is a human health issue there. We don't take an action that we believe should be addressed, so no action alternative fell out of our decision-making process of site four very quickly.

At site 21 and 22, it's a little different. Site 22, certainly there was the RECWA issues that are driving us to take a response action. Certainly we have to remove the biocell and restore the area, but there were also some erosion concerns that forced these sites up in the process.

In fact, we weren't going to address sites four, 21, 22 until later on in the program, but because of the erosion concerns and some of the RECWA concerns as a group when we began to partner on the issue, we decided to move it up.

And, in essence, we really need to clean-close the biocell and prevent the erosion of materials from site 22, adversely impact to Felgates Creek.

Based on that scope, we began to develop remedial action alternatives. We always evaluate no action because EPA requests that we look at no action as a baseline. But, again, that fell out of the process and out of our thinking very quickly.

The other alternatives we evaluated are

capping and ex-situ phytoremediation process that says we'll dig this stuff up and basically create these plots and pack the soil in these plots and grow certain types of plants. And by growing those plants, you'll uptake the contaminants, and then we can clean the soils that way by, in essence, harvesting the plants and disposing of the plants and then replacing the soil when the remedial action goals are reached.

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That's a rather costly alternative. But it was kind of a creative way of looking at it. And it also fulfills the obligation that we have to look at treatment technologies.

RAA 4 is excavation of off-site disposal. It's not always preferred, but it certainly is a tried and true means of getting rid of the problem. What we hope is that we don't make it somebody else's problem down the line.

We looked at RAA 5, which is a soil washing technique. Again, it's rather expensive. You have to pick this stuff up and wash it, and so it's not as clean a process as it may sound.

We also looked at one other process based on a few comments that we received from EPA and I believe some other of our regulatory committee, and that was a stabilization technology where you come in,

dig this stuff up, create a cement slurry, and put it in blocks and cover it up. I didn't think it was a very good way to go because the Navy is stuck with having to maintain at least a soil cover over the top of this. And it's pretty tough to grow the types of plants we want to get to regenerate on top of concrete.

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Again, kind of going over the alternatives and looking at the costs and whether or not they would or would not be protected. You can see RAA 1, no action. It's certainly not protective, but it's easy to go. It doesn't cost you anything to do that.

RAA 2, the capping technology, again you have to maintain this cover, and the station is not in the business of maintaining landfills. So, again, when we look at capping, it's always an attractive alternative because of the cost, but we're always aware of the fact that we're not really taking care of the problem; we're sort of deferring it, if you will, to the future.

The ex-situ phytoremediation, again it was rather costly. We would have to harvest and collect some soil and build a plot and harvest the plants, take a look at a trend analysis to see if it

was doing what it was supposed to. And \$1,200,000 for the cost. It is one of the more costly alternatives we evaluated.

RAA 4, again these are estimated costs.

And, Scott, you could probably give me a better indication now of where we stand because we've begun the process of talking to ITOHM about the actual cost for this type of remedy. But we had estimated it to be around \$980,000. Again, it's very implementable. It's certainly permanent because it's not something you have to worry about once we have taken it away.

The soil washing, again it's protective of human health. This says it's easily implementable. That's not necessarily true. Again, it's rather costly, about \$1,600,000, and plus you have to deal with residual wastes, and there would be some other issues to concern yourself with as well with respect to implementation.

So what we propose tonight and what we're asking for public input on is our preferred alternative, which is excavation and off-site disposal. We believe it's better in terms of the long-term effectiveness than a cap and something the station doesn't have to worry with after remediation

is completed, and it is certainly more implementable than either the soil washing alternative or the phytoremediation, and it is certainly more cost effective than either of those alternatives.

This is just giving you an idea of that site four where some of our little concerns are. And, again, because we had this removal action, you can see that our areas of contamination are rather small.

This map is pretty large in terms of scale. But you can see that we have an area where the ash pile once was situated where we believe there's some residual contamination remaining. And then there were some areas of debris in the southern portion of site four.

This was the area where high arsenic was detected. These are the areas that we'll dig up and haul away unless there is a significant concern by the public or regulators that they would like us to look at some other alternative.

This is site 21. And it's sort of difficult to see the boundary of the site, but the wood line starts in this area. Anything to the left of that is wooded. And so what you have is a drainage area, and we believe that the contamination, which has probably just over time leached and eroded and have ended up down at site 21, and these are areas that we

intend to excavate and dispose of off site. So, again, just some very small areas, the larger area in the southern portion section of site 21.

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Once we do this and remove it, there will be no more risk for ecologic receptors and there will be no property use restriction at either of these, certainly 21.

Site 22, this is the footprint of the biocell. And you notice that we have actually added the extension of the biocell and the pad, the staging pad. So this is a fairly up-to-date drawing. There was an area of erosion that was repaired on the western portion of the site. The eastern portion of the site is where we dewatered. And there was a large earth and dam that was breached in order to really to release the water that had collected in over time.

So this -- the biocell will be removed and disposed of accordingly. There will be sampling conducted to make sure there's no residual waste material under the biocell, and then this entire area will have to be regraded and vegetation established accordingly.

These are a little optimistic in terms of the dates. The final ROD is due March 30th. We're trying to push this so we can get into the field of

the optimum time. Talking to Jeff and having worked a little bit yesterday at site 17 with the natural resource folks, it's always imperative that we try to get any sort of cover or new vegetation established at the best time of the season. So the earlier we can begin the process of remediation, the more time things have to establish themselves before the dry weather gets here or before the winter.

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The public comment period began

January 21st. We posted the newspaper announcement in
the Virginian-Pilot, and it closes March 6, 2001. But
I don't think that anybody should consider these
hard-and-fast deadlines. These are really regulatory in
nature, and I'm sure Jeff and Scott will address any
concerns the public may have at any time.

That in a nutshell is the proposed remedial action for sites four, 21, and 22, and we'd be glad to take any questions you might have at this time.

MR. MOSS: Could you explain what happens to the soil after it leaves the gate, please?

MR. HARLOW: Well, I guess the cheapest is the best. And in the reality sense -- we try to minimize -- maybe just to stress up front, if there's a lot of debris, we'll separate it out best we can.

But if there's an actual waste, nonregulated, it will go to a certified landfill within basically the area.

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Fortunately -- maybe one of the things, I guess, Rich didn't explain on this is a couple of things, one, try not to be in the business of a landfill. I guess we do have a philosophy if it's four or five acres in size, we have it, we're stuck with it, and we'll deal with it. This is very small items of removal, and a lot of it is trash in concurrence with PAHs or whatever, so it's like a mix-type waste. There's not really any kind of hazardous waste, per se. It's more of a solid waste. And, unfortunately, there's no technology out there ready to deal with it in that sense, so we're basically stuck having to go to the landfill with it. Generally, over the years, it's been chambers -- and you might be able to jump in, too, Steve.

MR. MIHALKO: Generally, the state's solid waste regulations, there's only certain landfills within the state that are authorized to accept special wastes. Special wastes come from super fund sites. These are pretty much state-of-the-art landfills with liners and so forth. I believe there's three in this state that are authorized to accept it.

MR. MOSS: So your problem becomes their problem after it leaves the gate?

3 MR. MIHALKO: I wouldn't call it a 4 problem.

MR. MOSS: Monitoring and that kind of thing with the soil.

MR. MIHALKO: I wouldn't really call it a problem. They are designed to accept that kind of waste.

MR. HOFF: I guess, Barry, a way to look at it is that these are facilities that are designed to accept this type of material. And certainly they are managed and regulated accordingly; whereas, if we were to establish a number of capped areas on the station, the protectiveness really only applies to -- insofar as the station maintains the cover.

So I think that while certainly as we go through the feasibility study, we consider the short-term effectiveness. And part of that is knowing that we have to dig this up and it creates dust and we're going to put this in trucks, the trucks are going to have to leave the gate, as you said, and dust is always an issue with trucks moving in and out of the facility, and then certainly the final disposition of the material and where it will be disposed.

We do sample to determine whether or not the material is hazardous or nonhazardous, and that dictates as to what landfill the material would reside.

MR. MOSS: Will your costs include their costs of monitoring it forever, or do your costs end and theirs start?

MR. HOFF: In a sense it does because they build that into the cost per ton that they charge us.

MR. HARLOW: I mean, there is the risk that 30, 40 years from now, there may be some problem in that we may have to go back as a potential responsible party or whatever. And that's kind of the risk we are taking unfortunately. And like Rich says, the problem that we have is we're not in the business to manage landfills. Whether that's good or bad -- I mean, with it being small areas -- for me, I won't be there for forever.

And at some point I can almost assure you that because there's always little pockets of landfills, if that's what we ended up with, they would become poorly managed; whereas, the state can properly manage three or four within the state, I guess, and that's basically what it is. That landfill is in the

business of managing that waste, and that's what they do.

MR. MOSS: But down the road sometime, if there's a problem like a landfill, they will look at all of the people that put stuff in there and, you know, share the problem with you.

MR. HARLOW: Yes.

MR. HOFF: Correct. And that's one of the reasons that we do try and minimize what we send off to the station. Because certainly for hazardous waste, it's a cradle-to-grave ownership that the station has, and it's why they manifested this waste when it goes to certain hazardous waste material landfills.

It's not something we like to do. But when you look at all of the alternatives, it's probably the best alternative at this time.

MR. MOSS: Yeah. Probably this stuff is a lot better than some of the other things you have sent to landfills in the past?

MR. HOFF: We joke about it. We think a lot of what we send them ends up as clean cover in a lot of respects.

 $$\operatorname{MR}.$$  MIHALKO: A lot of time they use it for daily cover.

MR. HARLOW: They still charge us for it, but they are benefiting from it.

MR. HOFF: Again, I think we take a very aggressive position when we remediate based on ecological concerns. Because, again, we're looking at the individual, and there are a lot of ecological risk assessors that say, that's not the way to do it, you have to look at the effects on the population.

The problem is, how do you define an effect on population in a 16-, 18-, 24-month time period? It's almost impossible. So we do err on the side of conservatism by taking that material out and treating it on-site as we have in biocells in the past or by sending it to the appropriate landfills.

Yes, sir.

MR. HAVENS: In removing this soil, site
21, what depth is the soil removed in general?

MR. HOFF: For this site -- for these
three sites, it will be rather shallow. We'll go to
two feet.

MR. HAVENS: Two feet?

MR. HOFF: Yes, sir. We have determined that for site four and for site 21 the depth of contamination is in the top two feet of the soil horizon. That's what we intend to get.

MS. PHILLIPS: And determined how far the contamination goes down?

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MR. HOFF: Correct. In site 22 it might be a little different because when we sample under the biocell, if we find material under the biocell, we don't know how deep that might be. So we'll have to confirm as we dig there because, again, given the RECWA issues surrounding the biocells, we have to remove that to be protective of human health at all levels. So that's what's known as a clean closure under RECWA. And that's what we're shooting for at site 22; that would be clean closed.

MS. PHILLIPS: Do you add new soil as you remove it to the same depth as the contour?

MR. HOFF: Yes, we intend to use fill from the on-station borrow pits, and then we'll purchase topsoil as we need it to reestablish the vegetation. Hopefully, we can grade it to get it back to as natural a contour as it once was.

MR. HARLOW: Most of this is highland specific to these sites. I mean, where it's feasible to reclaim wetlands, we take that into consideration, too. Most of the areas you see here are way up, they are several, like tens of feet above sea level. So there's no impact really to the wetlands.

I'll back up and say at the bottom of the trench line of the site 21, between site 21 and 24, we may look at doing something of a pseudo regrading, and if we feel like it's more beneficial to the ecological to leave whatever we've cut out and put maybe some topsoil, we do consider that. It's usually field determined.

We'll bring fish & wildlife in and discuss it if it's feasible. Generally, as a rule, we look at backfilling to original grade, so we do change as we go along the sites and try to be smart about it.

CAPTAIN SKUDIN: Bouncing around a little bit, talking to some of the archeologists that have discovered that almost everywhere you dig on a station, you go through a topsoil layer that's rather thin, a sand layer, and then you get to this clay. And you can pretty well tell where it's been dug out. And it's going to drain along the top of that clay, so it's not all that hard to figure out.

MR. HARLOW: The two foot is a baseline, too. If there's contamination, we do confirmatory sampling under the construction end. And if we still are chasing it, whether it's a physical notice of staining or whatever or a confirmatory sample showed

further contamination, that two foot could go to four foot. It's not going to just cut off at two foot because that's what we said we'd do.

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MR. HOFF: Again, when we do a feasibility study, we have to make some very broad assumptions about the nature of the waste, and it's something we're working with and working together on as a team to better address the nature of contamination and waste material at the station.

In the past we've always surprised the remediation contractor. We give them these drawings and they go out in the field and the stuff isn't where we say it is, or if it's there, there's a lot more of it. So we're getting a little smarter on that and working more closely with John Dorm.

Annex where we're actually learning from our past mistakes. I wish I could say the process was perfect, but we learn as we go on this. We're going to try not to make the same mistakes twice. We're going to begin to look more aggressively with more invasive means of investigation. We're going to use a lot of trenching and a lot of digging, active digging as opposed to sampling which from an environmental prospective gets you good environmental data, but it doesn't tell you

anything about the site that you might have to remediate.

So I think there's some very exciting things happening as we move into Cheatham Annex. We have had the opportunity to really learn our lesson at Weapons Stations Yorktown. And I think that when you see some of the projects that we intendto undertake at Cheatham, you'll be very impressed because we are looking at returning natural grades, establishment of wetlands, and hopefully not doing as much off-site disposal as we may have in the past. We can't always promise that, but we'll try to really apply the concept of biological approaches to biological problems.

Any other questions?

Thank you for your time.

MS. PHILLIPS: This concludes the public portion part of the meeting, so we're going to take about a five-minute break, five to 10 minutes, stretch your legs, and then well come back and let Jeff give some updates.

(Hearing adjourned at 7:45 p.m.)

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### COURT REPORTER'S CERTIFICATE

I, SCOTT D. GREGG, RPR, and Notary

Public, certify that I recorded verbatim by Stenotype
the proceedings in the captioned cause, in Lackey,

Virginia, on February 21, 2001.

I further certify that to the best of my knowledge and belief, the foregoing transcript constitutes a true and correct transcript of the said proceedings.

Given under my hand this  $\frac{10^{10}}{10^{10}}$  day of  $\frac{10^{10}}{10^{10}}$ , 2001, at Norfolk, Virginia.

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Scott D. Gregg